The
Chemical Age

VOL LXIX | 18 JULY 1953 | No 1775

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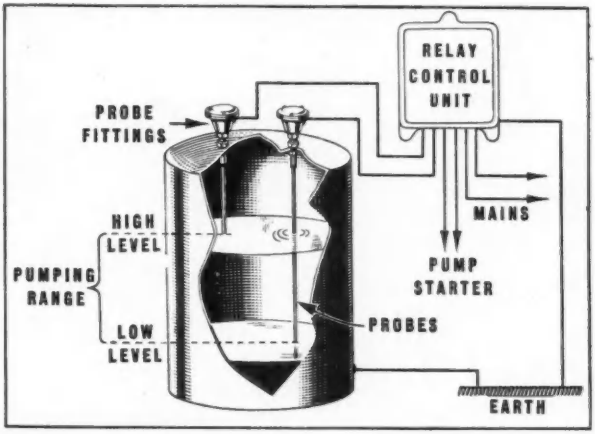

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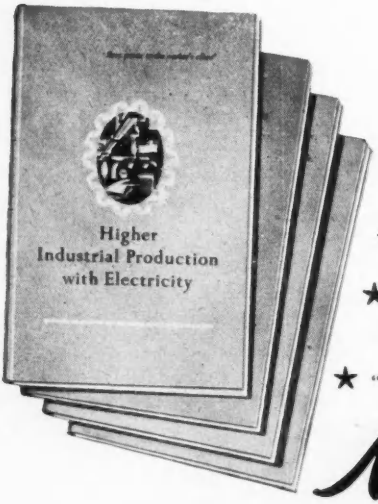

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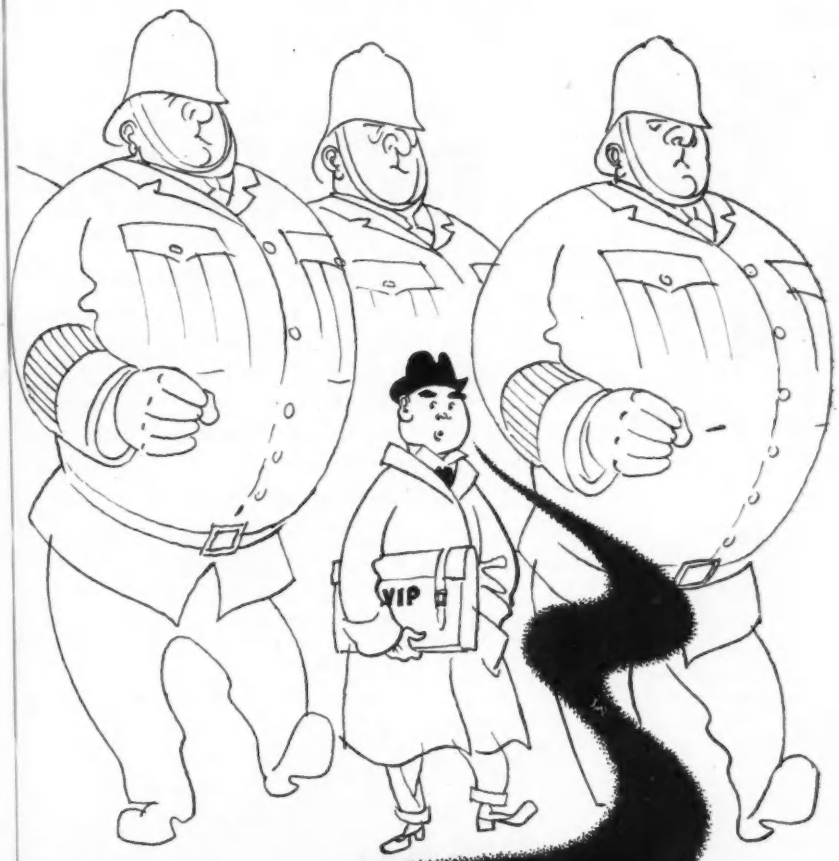

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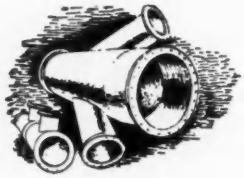

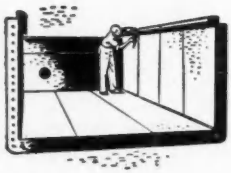

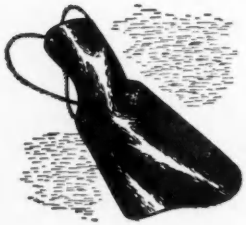

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Volume LXIX 18 July 1953 Number 1775

Atomic Power Prospects

OUR last survey of this major topic of the future (THE CHEMICAL AGE, 1952, **67**, 751) was based upon views then expressed by British scientists. The conclusion was reached that further development depended more upon chemical engineers and chemists than upon atomic scientists. Sir John Cockcroft had gone so far as saying that 'the cost of electricity derived from nuclear energy will depend almost entirely on the cost of chemical processing.' Judging from reports recently published in the United States a large measure of agreement with this assessment is to be found there.

In America a number of scientific teams from industry were invited to co-operate with the Atomic Energy Commission in studying the development of industrial power by atomic fission. Each team was able to make its own designs for reactors, basic information being supplied by AEC. No one can say how genuinely valid the results of these studies are. The whole subject is hedged with restrictions upon knowledge, and published reports can indulge only in information that has been 'de-classified.' Realistically this means that atomic subjects must not be discussed at any level of development or information that is higher than a cautious Western estimate of the state of contemporary Eastern progress. We can certainly assume that the post-war story of leakages has made the process of 'de-classification' slow and cautious to the point of frugality. Indeed, the freedom given to nominees of US industry to design their own reactors may well be a symptom of secrecy; for while these private designs have been readily 'de-classified' we do not know whether the AEC itself has far better designs.

Nevertheless, the various teams all reached the conclusion that Government aid would be needed for at least the first five years of actual atomic power development. The necessity for this aid centred upon the costs of purchasing or developing plutonium, the product of the so-called breeder pile, Uranium itself, as previously reported when we last discussed atomic power and its prospects, is not an economically suitable fuel for only its small content of U-235 is useable; it can be breeder-pile converted

into plutonium, and a breeder can be defined—at any rate in theory—as a reactor that produces more fissionable material than it burns. It hardly seems an exaggerated deduction to assume that the raw material needs of atomic weapons and atomic energy are currently in a state of overlapping conflict. The first country to develop power from nuclear energy could well be a relatively small but technically advanced country.

Non-breeder systems were not disregarded. A reactor using helium gas for cooling and natural uranium for fuel was designed with an estimated cost of $40,000,000 and giving a net output of 46,700 kW. Another uranium reactor with heavy water (deuterium) as cooler had an estimated cost of $118,000,000 and a net output of 211,500 kW. Of the two non-breeder reactor systems, practical preference was expressed in favour of the gas-cooled design, despite the fact that the heavy-water system had the better economic economic potentialities. But it seems a fair conclusion that any interest in a non-breeder design is solely created by the immediate supply difficulties of plutonium or other 'enriched' fuels. Far more optimism must be associated with a liquid-metal cooled and plutonium-breeding reactor; in this system, as in the less detailed British suggestions discussed previously, molten sodium is selected as the coolant. Solid fuel in the form of a uranium alloy in a fast neutron reactor operating at high temperature is visualised for an initial design, but ultimately the use of liquid fuels—uranium eutectics, slurries of uranium alloys in low-melting alloys, or fused uranium salts—is regard as superior. An atomic energy plant should breed its own enriched fuel for the sale of fissionable by-products will help to offset the high costs of reactor plant construction.

It would seem, then, that what America can say in 1953 is not in advance of what British atomic scientists could say in 1952. The breeder-reactor with liquid sodium as the cooler is the most practical hope in the forseeable future for both sides of the Atlantic. With that assessment we must remain content, though we may not be unduly cynical in attributing this unanimity of opinion to the common factor of secrecy. Clearly an enormous effort is required from chemical engineers and metallurgists if the development problems of liquid sodium circulation, and perhaps also of liquid uranium-based fuels, are to be solved. It may be doubted whether UK or US atomic energy research centres can achieve success alone. The extent to which industry can help seems highly dependent upon the extent to which it is fully informed.

On Other Pages

The annual subscription to THE CHEMICAL AGE is 42s. Single copies, 1s.; post paid, 1s. 3d. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3954/5). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784/5). LEEDS OFFICE: Martins Bank Chambers, Park Row, Leeds, 1 (Leeds 22601). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers Limited.

Notes & Comments

No Fire without Ash

ONE of the interesting points brought out in the Fire Research Station report concerns the fire-resistance of wall-board. The behaviour of surface finishes during the early stages of a fire is generally assessed according to the 'Surface Spread of Flame Test' of BS 476-1932, but recent experiments with model rooms have shown that, although a combustible wall-board which has been given a fire-retardant treatment behaves as an incombustible material at first, it will, once a certain stage is reached, catch fire as readily as an untreated material. The critical factor involved is temperature, and anything which will serve as a heat insulator will help to keep the board unburnt. From America now comes news that the Cellotex Corporation have produced an 'intumescent' paint; when a flame strikes the paint it immediately 'swells, chars, bubbles, and produces a firm charred ash' which shields the board from heat. Water or oil-based mixtures can be produced, and work is now in progress to improve the washability of the surfaces. This is a development which should prove of great benefit to all users of fibre board, a material which is being used in ever-increasing quantities in building work. Further developments will be watched with interest.

Canada Advances in Chemicals

THE Canadian chemical industry is continuing its steady expansion. In 1952 output of chemical products rose by 3 per cent, and reached a new record for total value—over $800,000,000. This progress, however, was not evenly demonstrated along the entire chemical front. There were, compared with 1951, sharp declines for heavy chemicals (−2.9 per cent), vegetable oils (−11.9 per cent), primary plastics (−11.4 per cent), and adhesives (−3.4 per cent). There is more than a casual indication that expansion is strongest in the chemical product fields, e.g., toilet preparations, polishes, soaps, etc. The past tendency of Canada to turn out primary and semi-refined materials is being reduced, a change long insisted upon by Canadian economists and industrialists. Of the more primary chemical commodities, the notable increases in output were for fertilisers (5.3 per cent), compressed gases (3.6 per cent), and coal tar distillation products (3.4 per cent). Canada's chemical balance for exports and imports is still negative. 1952 chemical imports—$187,700,000; 1952 chemical exports—$124,600,000. In itself this adverse balance matters little enough for Canada exports large tonnages of raw materials, minerals, etc., but every major import of refined chemical products is a challenge to Canada's own chemical factories.

U.K. Losing Ground

BROADLY, Canada's imports of chemical products dropped by a little more than 2 per cent in 1952. But this over-generalised statement evades a disturbing point for our own digestion. The imports from the United States actually increased by a little over $1,000,000, a very small rise on a total of over $160,000,000, but nevertheless an increase. But imports of chemicals from the United Kingdom fell by nearly $4,000,000, and this decrease on what is in any case only a small annual total ($16,200,000 in 1951) is proportionately large and serious. We are losing ground in Canada, and it is not enough to say that chemical exports to Canada must logically fall as her own industry grows. The fall in British exports to Canada from 1951 to 1952 is almost 25 per cent—more than 12 times the general rate of fall!

The Essential Engineer

HAPPILY coincident with the publication of the Advisory Council's report on scientific research and industry (see p. 118) is the appearance of a short guide, published by the Institution of Chemical Engineers, to 'Careers in Chemical Engineering.' The chemical engineer is probably the most necessary, but the least appreciated,

requirement in any modern chemical factory, and this booklet, while intended primarily to attract new recruits to the profession, may well serve at the same time to persuade employers of their importance. More than anyone else, the chemical engineer can bridge the gap between the research laboratory and the factory, and by his understanding of the unitary nature of operations and processes, can advance development with the 'necessary speed and enterprise.' The guide describes how it all began, what chemical engineering really is, what a chemical engineer does, where chemical engineers are employed, and how chemical engineers are trained, and may be obtained from the Institution, price 2s. post free.

Bare Blackboards?

A SERIOUS problem that has frequently been commented upon in our own columns made an energetic appearance last week in the correspondence columns of the *Daily Telegraph*. That problem is the deepening scarcity of science teachers in our schools. The wider ventilation of this topic will certainly do no harm. It is indeed time that the public—and perhaps parents in particular—became more conscientiously aware of this growing weakness in British educational arrangements. The fact that the opening letter misquoted data from a report by the Oxford University Appointments Committee—at any rate the Secretary of the Board wrote a letter disowning the figures cited—may unfortunately persuade some readers of the newspaper in question that the problem's severity is being exaggerated. Relatively small errors in figures, however, are beside the point, and alarm is demonstrably justified.

Teaching Unpopular

ONE writer suggested that research-consciousness is now so highly developed in science graduates that teaching in schools no longer appeals to them. The validity of this point seemed stretched beyond its elastic limit, however, when he suggested that scientists would be more willing to teach if they were 'humanised.' There is nothing de humanised about the research way of life, particularly in industry. On the contrary, there is usually a powerful atmosphere of team-work in which junior and senior workers cheerfully take the rough with the smooth. The sense of vocation that is seldom displayed today towards teaching as a scientist's career is not very different from the sense of vocation that attracts graduates to research appointments.

An Opinion Poll?

ANOTHER contributor felt that few scientists of high quality would be likely to possess the stimulating qualities needed in teaching, and put forward the scarcity-relieving idea of guest-lecturers from industry to give short courses to sixth forms. In our view neither the theory nor the palliative is sound. Twenty years ago first-class scientists taught their subjects admirably enough in most schools—surely there is no reason to suppose that scientists have changed so much in so short a time? As for visiting lecturers or teachers, of what real value could their occasional efforts be? Every scientific subject has reached out-size dimensions in a mere decade, and teaching science must inevitably be a day-in day-out task. This is not one of those scarcities than can be solved by part-time devices or substitutes. A most enlightening 'opinion poll' might well be carried out by one of our chemical societies. A round number of present-day middle-aged scientists—say, 500—might be asked the question: 'Do you consider that science masters at school played a more important part in your training than university teachers?' The result might underline the seriousness of the shortage.

Works Visits

Wild-Barfield Electric Furnaces Limited, Elecfurn Works, Watford By-Pass, Watford, Herts, have announced that they would welcome visits to their works during the coming winter season (October-May) by senior students of technical colleges and like institutions. Tours will include an inspection of the research and development departments, as well as the production side and will take place during the afternoon of any work day (Monday to Friday).

Chemicals from Petroleum

Changing Concepts Likely to Affect Future Production

SOME of the important aspects influencing the tremendous growth of the production of chemicals from petroleum, particularly in Great Britain since the war, and changing concepts which will have a bearing on its future growth, were dealt with by Mr. W. F. Mitchell, of the Shell Petroleum Company, Ltd., at a recent Oil Industry luncheon.

In the course of his address, Mr. Mitchell said that in the USA, the birth-place of petroleum chemicals, where expansion of production had been greatest, petroleum chemicals were laboratory curiosities in 1925; by 1952, 7,500,000 tons were produced. In Western Europe, where development had been confined to the post-war period, the best estimate of petroleum chemicals produced in 1952 was of the order of 450,000 tons.

As was known, natural gas and petroleum itself were the petroleum raw material sources for the synthesis of chemicals.

With the need to find improved fuels for prime movers, and in order to increase the quantities of light fractions from crude, heating under pressure, or cracking, was first employed in the 1920's. By that method larger and heavier molecules were broken down into lighter ones yielding increased quantities of volatiles. Some of those were gases at normal temperatures and pressures, such as butylenes, propylene and ethylene.

Raw Material Sources

When these became available in abundance in America, due to the extension of petroleum cracking, they were readily recognised as sources of hydrocarbon raw material for the production of simple organic chemicals, such as acetone and methyl ethyl ketone, which had been produced previously at high cost and in limited quantity by fermentation.

Petroleum organisations were led into the chemical business by the realisation on the part of management and technicians alike that from abundant and cheap reactive cracked gases, simple chemistry could produce materials which would find ready market acceptance, and also yield a profit greater than from the use of those gases in other directions. At the same time, hydrogenation techniques acquired from the chemical industry were employed to manufacture ammonia by the Haber-Bosch synthesis, using natural gas as a raw material.

To take those first simple and rather faltering steps into the chemical business, the oil companies did not require expert knowledge of chemical markets, nor wide knowledge of chemical reactions; it was, perhaps, fortuitous that market openings existed and that the new feed stocks made available by cracking were so abundant and cheap.

Oil Industry's Success

That success by the oil industry in a new field was like heady wine, and the petroleum and popular Press trumpeted the achievements abroad, instilling in the minds of the general public the thought that chemicals from petroleum were produced by oil companies in tremendous volume and with great profit. The facts, however, were somewhat at variance with that popular concept.

It was estimated that in 1952 only about 35 per cent of the total turnover on finished petroleum chemicals in the UK represented a direct return to the oil companies. Sales of raw materials to other concerns engaged in petroleum chemical manufacture, however, gave the oil companies an additional return equivalent to about 19 per cent of the total turnover on finished products. In the USA and Canada at the same time 143 corporations were producing petroleum chemicals, 58 of whom were petroleum companies or subsidiaries. 79 chemical companies proper and six were joint oil and chemical company operations.

This demonstrated that although the petroleum chemical industry was started by the petroleum companies themselves, the chemical industry—quickly realising the value of petroleum raw materials—developed petroleum as a raw material in their own operations, resulting in a production which surpassed the value of the production from the oil companies.

The concept that the oil industry was leading the way in the production of petroleum chemicals, therefore, did not stand up to close scrutiny. Members of the petroleum industry had to face the fact that much of

the further expansion and many future developments in the petroleum chemical industry would not take place within petroleum operations and were unlikely to be fostered by their own petroleum industry. They were more likely to be carried out within the operations of the large established chemical companies and within the scope of those few petroleum companies who had built up and sustained comprehensive chemical operations from the very beginning of the petroleum chemical industry development.

Faced with Problems

In economy, and for that matter in politics, as with all mutations in industry, there were various good reasons for that changing concept. It was logical that in the first period of development in the petroleum chemical industry the petroleum companies, having an abundance of cheap raw material, added to their operations the manufacture of certain chemicals. Perhaps some recognised a good thing when they saw it and others may have been wooed by the romance of entering a new field. Certainly all appreciated the attraction of upgrading the value of a barrel of oil, particularly where the barrel of oil in terms of fuel gas had only little value in the normal outlets for petroleum products. However, as soon as further steps had to be taken on the road to more diversified and extensive chemical activities, the oil company managements were faced with a great many problems which multiplied the further they tried to penetrate into the chemical field.

The chemical industry, as distinct from the oil industry, catered for many markets and a great diversity of end uses, whereas the petroleum industry in the main supplied energy for prime movers. Hardly any branch of industry today could do without a multitude of chemicals which assisted in various steps of production and contributed to the end product. As a consequence of that diversity of outlets, the chemical industry was forced to produce many of its products to stringent specifications without eye or sex appeal. As a simple example, the customers of the chemical industry who required solvents for surface coatings could not be satisfied with two or three grades, but required a thousand and one special formulations, each of which was essential for the particular surface coating.

That, however, was not all. Many of the customers did not themselves possess sufficient knowledge to apply the right chemical for the right purpose. In the course of the years the chemical industry had been forced to work out many of the problems facing their customers in using their products and now few chemicals, unless of the most simple specification, were sold without the backing of an extensive technical service based on work done in the supplier's laboratories. The customer expected the supplier to solve his particular problems and to show him the way to apply the chemicals in the most suitable manner for his particular application.

In fine, chemical companies had to supply the right product at the right price, catering for many markets, each of which moved more or less independently. The sale of chemicals must be backed up by intensive technical service. The differences in marketing, however, were not the only features which distinguished the chemical industry from the oil industry. On the production side the chemical industry could proudly display some large-scale production and bulk shipment of chemicals was admittedly becoming more common daily. Nevertheless, both in size of production and quantity of shipments, the petroleum chemical industry was Lilliputian beside the oil industry and a few thousand tons of chemical production a year suffered badly by comparison with millions of tons of oil, although the difference in unit value of each might be very great.

Manufacturing Philosophy

That difference in size of manufacture, combined with the intricacies of most chemical processes, required a manufacturing philosophy which was rather different from that prevailing in the oil industry. Although dealing with smaller quantities, petroleum chemical manufacture was characterised by the movement of small volumes of reactive and ofttimes corrosive chemicals and intermediates at temperatures and pressures not normally found in refineries—where precise measurement and control played a large part in the yield structure and where specialised maintenance was the order of the day.

In addition to efficient plant operation, a successful petroleum chemical enterprise was bounded by the ability of the manufacturer to select processes which would yield a minimum of by-products and co-products except in circumstances that would permit the

balanced production and sale of such by-products and co-products. Furthermore, in the petroleum chemical industry new and modified processes replaced existing ones regularly and only by making the full use of available raw materials and intermediates, and by utilising every by-product and co-product in new phases of production, did the individual chemical manufacturer succeed in his ventures.

As a logical consequence, the chemical industry required an exacting costing procedure to enable the producer to know the accurate cost at each stage of production. Costing methods applied in the oil industry were necessarily empirical as compared with the costing the chemical industry applied in each phase of production.

The petroleum chemical industry had become considerably more complex from the days of its infancy, not only in its operations, but in the variety of its products. That had been brought about by the interplay of marketing, manufacturing and research, in which research played no small part.

To support a vigorous petroleum chemical enterprise, fundamental and applicational research were required to the extent that a bigger share of the profit pound was diverted to chemical research than to oil research. That did not imply, however, that profits were reduced to the extent of the increased research expenditure, but rather that the value of chemicals was adjusted of necessity to include higher research and market development expenses which were an accepted feature of that type of business.

Petroleum Research

Fundamental chemical research for the production of petroleum chemicals could in certain circumstances find application in petroleum technology. Similarly, researches in refining techniques could also lead to applications in the manufacture of petroleum chemicals, but at the marketing stage, applicational research in the chemical field was as different from applicational research for petroleum products as chalk was from cheese.

The differences which had emerged between the oil and petroleum chemical industries went a long way to explain why in the early stages of the petroleum chemical industry the oil companies were the prime producers. As time went on, and there arose technological and marketing difficulties inherent to the chemical industry, some of those companies reached the conclusion that they should curb their activities in the petroleum chemical field. The chemical companies proper were now more fully engaged in the manufacture and sale of chemicals from petroleum than were the petroleum companies themselves, with the exception of a very few oil companies who found justification for remaining in the chemical field.

Community of Interest

While on one side fully integrated chemical concerns operated in the petroleum chemical field and on the other were oil companies with substantial chemical operations, there was a plateau of activity on which both oil and chemical concerns could find a community of interest. The pattern of co-existence was emerging where oil and chemical companies were coming together, both making contributions to the enterprise.

The chemical industry had spent large sums of money on the development of synthetic fibres. To his knowledge, no oil company was engaged or was thinking of engaging in actual commercial production of synthetic fibres, but nevertheless the oil industry had a very real rôle to play by providing an abundant source of critical raw materials required for a rapid and significant extension of synthetic fibre production, thus illustrating the growing interdependence between the petroleum industry, the petroleum chemical industry and the chemical industry.

To enter the petroleum chemical industry the oil industry had to learn to swim in strange and difficult waters and close scrutiny would reveal that it was not as easy as it looked to produce and market chemicals from oil raw materials, particularly at the present stage of industrial development.

In conclusion, Mr. Mitchell said it should not be inferred that the petroleum chemical industry was not profitable for those who had been in its development from an early stage, but it was not sufficient to have the right raw materials at low cost in order to succeed. Above all, it was necessary to absorb the basic philosophy of the chemical industry and apply it to research, manufacturing and marketing. The petroleum chemical industry, being closely related to the chemical industry as a whole, possessed both the opportunities and the restrictions of that great industry.

Narrowing the Gap

The Exploitation of Scientific Discovery by Industry

OF the 140,000 manufacturing establishments (not including such industries as building, transport, or fuel and power) in this country, 82,000 employ not more than 10 men; almost a quarter of the labour force in British manufacturing industry (some 8,500,000 in all) is in establishments employing 50 men or less. These figures, given in the sixth annual report of the Advisory Council on Scientific Policy (chairman: Professor A. R. Todd) make clear one of the reasons why British industry is so badly supplied with technically qualified men and women; these very small firms cannot afford to devote at least 10 per cent of their manpower to the research and development they need.

A more serious reason is also put forward by the Advisory Council: 'The primary reason why our industry as a whole does not make more use of scientists is not because their numbers were, and are, insufficient, but because large sections of industry, being conservative and complacent, have neither missed them nor asked for them.'

The report is devoted to a special study of the 'Exploitation of Science by Industry,' and embodies a number of conclusions and recommendations.

More Technologists Required

The first is that 'it is an essential condition of our survival that the number of trained scientists and technologists employed in industry be greatly increased.' Announcements have already been made of the Government's intention to increase the resources available for the teaching and study of the various form of technology, and if industry can be persuaded to accept the need for more technologists, their demands can probably be met.

A second recommendation, likely to meet considerable opposition in the majority of small companies which make up British industry, calls for the 'increasing use of scientists and technically trained men on the boards of management,' since boards on which technical representation is small or non-existent 'cannot hope to take advantage of the results of scientific research with the necessary speed and enterprise.'

Thirdly, 'we can hardly expect to live by our industry unless we change the pattern of our production and seek to develop new products and processes, which . . . will keep us in the forefront.'

The Report considers in some detail the problem of a low level of investment, and states 'clearly the most effective single measure which would conduce to a greater exploitation of science by industry would be a significant increase in the volume of investment.'

Principal Recommendations

The principal recommendations in the Report are concerned with narrowing the gap between scientific discovery and industrial output, and in particular four possible improvements were considered. With regard to the effect of building licence control on industrial development, the council were informed 'that over 85 per cent (in terms of value) of the industrial projects for which building licences are sought are now allowed to proceed, and that, of the industrial research and development projects submitted for licensing, the proportion rejected is negligible.'

The inducements to research and development already provided under the taxation system leave little scope for further relief, although 'if it were possible to expedite the write-off of capital facilities, or of special facilities needed to ensure organised scientific development, the volume of research and development carried out by industry would probably increase.'

With regard to Research Associations, the Advisory Council is of the opinion that the firms within some industrial groups do not seem to be contributing enough towards their finance.

Finally, it is felt that 'extension of the use of research and development contracts, largely through existing organisations, offers great possibilities in the modernisation of civilian industry and its exploitation of scientific discoveries. We hope that the appropriate authorities will give further, and urgent, consideration to the machinery necessary for this extension.'

'Sixth Annual Report of the Advisory Council on Scientific Policy (1952-53)' HMSO 6d.

Great Historical Moment Recorded

Model Shows Discovery of Nickel Carbonyl

ONE of the great moments in the history of chemistry has been recorded in a model made for the Mond Nickel Company, Limited by Mr. H. Broun-Morison. The scene is the laboratory of Dr. Ludwig Mond in Avenue Road, Hampstead, on an evening in 1888, when nickel carbonyl was discovered.

On that evening one of a series of experiments was in progress to discover why a carbon coating had developed on some nickel valves used in a plant for volatilising ammonium chloride at Mond's chemical works. Earlier investigations had suggested that carbon monoxide was responsible, and the effect of finely divided nickel at about 350° C. in bringing about the decomposition of carbon monoxide into carbon dioxide and free carbon was being studied. In the apparatus on the bench, carbon monoxide was passed slowly over finely divided nickel within the tube, and, except when sampling for analysis, the gas was allowed to burn at the exit end of the tube.

At the end of the day's experiments, one of Mond's collaborators had turned off the furnace burners prior to shutting down the apparatus. When the tube had cooled to about 100° C., the characteristic blue flame of carbon monoxide was seen to change to yellow. As the temperature fell lower the flame became very luminous, and when the glass tube at the exit end was heated a metal mirror formed on it. This mirror proved to be nickel.

The laboratory was in the grounds of Ludwig Mond's house and when told of the unexpected turn the experiment had taken he came over to see for himself. This is the moment portrayed in the model.

Examination showed that the gas containing the volatilised nickel was nickel carbonyl. Further experiments were made in an attempt to obtain similar compounds of iron and cobalt, but while iron carbonyl was obtained in minute amounts no trace of cobalt carbonyl could be detected. Some years later Mond did succeed in isolating carbonyls of cobalt, ruthenium and molybdenum, but the readiness of nickel to form a volatile carbonyl and his initial failure to obtain cobalt carbonyl showed Mond the way to a new process for producing pure nickel from the nickel-cobalt-copper containing ores.

Ludwig Mond was a man of wide interests in science, art and the humanities. He was a pioneer in industrial welfare. But it is as a chemist of genius that he is rightly remembered, for it was discoveries made in laboratories under his direction and his application of these discoveries on an industrial scale that have earned him a place in the history of chemistry.

The model, which is said to be an exact replica of Dr. Mond's Hampstead laboratory, should be of great interest to all those interested in the history of chemistry. It was shown to members of the trade and technical press at a luncheon held by the company at Marsham Court, London, S.W.1, on 6 July.

A photograph of the model of Dr. Ludwig Mond's laboratory

Changes in Poisons List

Several Alterations Proposed

STATUTORY Instruments giving effect to recommendations made to the Secretary of State by the Poisons Board are being prepared. It is proposed to make the following changes in the Poisons List and the Schedules to the Poisons Rules.

1. Sodium nitrite will be added to Part II of the Poisons List, and provision will be made in Group II of the Third Schedule to the Poison Rules for exempting it from the requirements of the Pharmacy and Poisons Act and the Poisons Rules except when in the form of preparations for the destruction of rats or mice.

2. The general heading: 'Anti-histamine substances, the following; their salts' will, wherever it is used in the Poisons List and the Schedules to the Poisons Rules, be amended to read: 'Anti-histamine substances the following: their salts; their molecular compounds.'

3. Ambodryl, under a name to be approved by the British Pharmacopœia Commision, will be added to the series of anti-histamine substances included in Part I of the Poisons List and the Schedules to the Poisons Rules.

4. Chlorpromazine will be added to Part I of the Poisons List and the First and Fourth Schedules to the Poisons Rules.

5. Phenylbutazone will be added to Part I of the Poisons List and the First and Fourth Schedules to the Poisons Rules.

6. The dithienylallylamine compounds will be added to Part I of the Poisons List and the First and Fourth Schedules to the Poisons Rules; inclusion in the Fourth Schedule will cease should the substances be controlled under the Dangerous Drugs Law.

7. Mustine will be added to Part I of the Poisons List and the First and Fourth Schedules to the Poisons Rules. Triethylene melamine and myleran, under names to be approved by the British Pharmacopœia Commission, will be made subject to the same control.

8. N-allylnomophine, 3-methoxy-N-methylmorphian and morpholinylethylmorphine will be added to Part I of the Poisons List and the First Schedule to the Poisons Rules. Exemption from the requirements of the First Schedule will be provided for substances containing less than 1.5 per cent of morpholinylethylmorphine.

9 Procaine when associated with penicillin or other substances to which the Therapeutic Substances (Prevention of Misuse) Act applies, and included in concentrates or animal feeding stuffs covered by Regulations made under that Act, will be exempted from the requirements of the Pharmacy and Poisons Act and the Poisons Rules.

USA Industrial Explosives

CONSUMPTION of industrial explosives in the USA during 1952 reached the record figure of 764,718,364 lb.—about one per cent higher than the previous record for 1951—according to the Bureau of Mines, USA Department of the Interior.

The largest consumer of industrial explosives was the coal-mining industry, which consumed 35 per cent of the total quantity produced, although this was 4 per cent less than the previous year's total. Metal mines consumed 3 per cent more explosives than they did the previous year, while quarries and non-metal mines used 10 per cent more than in 1951. For railway and other construction work nearly 8 per cent more explosives were required than in 1951.

CRE Industries Branch

The Industries Branch of the Board of Trade's Commercial Relations and Exports Department will move to Lacon House, Theobalds Road, London, W.C.1, on Tuesday, 21 July. (Tel.: CHAncery 4411). At the same time, its title will be changed to 'Export Services Branch.' Inquiries relating to trade policy between the United Kingdom and individual countries overseas, and to general policy not peculiar to trade with any one country should continue to be directed to the Commercial Relations and Exports Department, Horse Guards Avenue, London, S.W.1. (TRAfalgar 8855).

Iron & Steel Board

The Iron and Steel Board, who have now assumed their responsibilities under the Iron and Steel Act 1953, are in the course of arranging accommodation and staff. Offices are being equipped at the Board's headquarters, Norfolk House, St. James's Square (Tel. No. WHI 6931), where there is already a nucleus staff.

Pest Infestation

Chemical Methods in its Treatment & Prevention

WHERE do pest infestations come from and by what means? What conditions are required by each species for its survival, and how soon does it die under various unfavourable conditions? What is the net rate of increase of each species under the various conditions in which it can live? Questions such as these dictate the programme of the Pest Infestation Laboratory, DSIR, whose report for 1952 has just been published.

The production of unfavourable conditions necessarily involves the use of chemicals, and much of the laboratory's work is concerned with the evaluation, comparison and application of pesticides. A number of synthetic materials have been tested against flour beetles, *Tribolium castaneum*, and grain weevils, *Calandra granaria*: aldrin and dieldrin were found to be more toxic than gamma-BHC when applied in Shell oil P31; dimetan and pyrolan, two derivatives of urethane, were of low toxicity, but have been reported to be toxic to DDT-resistant houseflies; and valone (2-*iso*valeryl-1,3-indandione), although only a third as toxic to *T. castaneum* as pyrethrins, kills about three times as fast.

Some biological tests have been performed on houseflies to determine how two synthetic isomers of N-*iso*butyl-deca-2,4-dienyl amide compared in toxicity with natural pellitorine. Tests in the small fly-spray chamber showed that one isomer was about 0.4, and the other about 0.03, times as toxic as the natural material.

Determination of Pyrethrins

It was noted several years ago that *T. castaneum* lost weight rapidly when treated with pyrethrins, the weight lost in a given time being related to the dosage. This has been put to use in a new technique for the rapid determination of pyrethrins.

Whatman 544 papers are sprayed with standard and test solutions of pyrethrins in P31, at a series of dilutions. Beetles, in batches of 100 each weighed to 0.1 mg., are exposed on the papers for three hours at 25° and 70 per cent R.H. By suitable statistical analysis the losses in weight of a batch of beetles can be used to estimate the potency of the test preparation relative to the standard.

An extensive study of the chemistry of the pyrethins and related compounds has been initiated, with particular emphasis on properties of possible analytical importance. Several new and interesting reactions have been discovered and attempts are being made to develop one of them as a basis for pyrethrum assay.

Refuse Depot

An analysis has been made of the results of the 1951 experiments at the railways sidings where refuse is collected and sorted in North London. It was estimated from soil samples that, at one time during the height of the season, there were some 25,000,000 blowfly larvae in 15,000 sq. ft. of ground covered by tracks. Trapping on untreated plots show that the normal emergence of adult flies from the area would have been more than 108,000 every day.

The most effective treatment was found to be a twice-weekly application of 5 per cent DDT dust, which gave an overall control of 99 per cent. Recommendations based on the results of the experiments were adopted in their entirety by the Borough Council concerned and, for a total cost of £100, emergence of flies from the area was virtually prevented during 1952.

Blowflies which had previously been fed on a radioactive-phosphorus salt were released at the refuse sorting depot at Islington, and traps were placed over a radius of two miles. A preliminary analysis of the data shows that the flies dispersed at the rate of at least one mile per day, and contributed to infestations at shops, canteens, factories, hospitals, etc.

Some collaborative work has been carried out with the Central Public Health Laboratories, where samples of trapped flies were examined for pathogenic organisms. The heat-resistant bacterium, *Clostridium welchii*, an important food-poisoning organism, was found on all batches examined.

Nearly fully grown larvae of the common clothes moth, *Tineola bisselliela*, were exposed to films on filter paper of DDT, pyrethrum, and gamma-BHC solutions in kero-

sene. At similar concentrations and deposits 100 per cent mortality of the larvae was not quite attained in 20 days' exposure to DDT, but was reached in seven days or less exposure to gamma-BHC or pyrethrum. Larvae sprayed directly with 1 per cent DDT in kerosene were killed in three days; those sprayed with the solvent alone died in 14-15 days.

Samples of wool serge sprayed with DDT or BHC in kerosene were allowed to dry for a week and then exposed to moth larvae. A deposit (using a 1 per cent solution) of 0.12 per cent by weight of DDT on the cloth killed all the larvae within 14 days; this amount of DDT, when applied to the material by impregnation, would be sufficient to proof the cloth. Lower deposits of DDT killed the larvae more slowly and thus allowed them to do a certain amount of damage.

With 0.2 per cent by weight of gamma-BHC on the cloth, applied as a 1.5 per cent solution, 100 per cent kill of the larvae was not attained until the 17th day of exposure. This slowness may have been due in part to some loss by volatilisation during the drying of the samples.

A high level of control has been achieved of the common black ant, *Lasius niger*, and of Pharaoh's ant, *Monomorium pharaonis*, by thorough application of a 2 per cent solution of chlordane (octa-chloro-4,7-methano-tetrahydroindane) in refined kerosene.

Grain Fumigation

The method of fumigating grain in silo bins by spraying carbon tetrachloride over the grain surface has given useful results in routine use. Tests have now been carried out with mixtures of carbon tetrachloride and ethylene dibromide, and of carbon tetrachloride and methyl bromide.

It would appear that the addition of about 5 per cent by volume of ethylene dibromide will give a good control of insects present in the surface layers of grain and in the air space above. Milling and baking tests carried out by the Cereals Research Station, St. Albans, showed no deterioration in quality or taint in the bread.

Amounts of methyl bromide added to the carbon tetrachloride varied from 3 per cent to 10 per cent by weight. Tests showed that at grain temperatures of the order of 15° or lower, the speed of downward penetration of both components is too low, but at temperatures of 22° or above, a reasonably even distribution of the methyl bromide is rapidly obtained, the CCl_4 acting as a 'barrier.'

A 5 per cent mixture would seem to be adequate; it should possess a much higher toxicity to insects than carbon tetrachloride alone, and its use should increase the probability that an effective treatment will be obtained. A mixture of this type is readily prepared by running methyl bromide from a cylinder into a drum of carbon tetrachloride, the pipe being kept below the surface of the liquid. The vapour pressure and rate of evaporation of the methyl bromide are low, and the fumigant can be applied as in the usual CCl_4 treatment.

Reaction of MeBr with Wheat

Work has continued on the nature of the chemical reactions between wheat and methyl bromide under the conditions of fumigation. It had earlier been shown that about half of the residual methyl bromide was present as methyl sulphonium, methoxy, and thiomethoxy derivatives. The remaining half appeared to be present as N-methylated derivatives of the gluten fraction. Work during the year has been directed at identifying the N-methylated derivatives.

A milled sample of wheat, grown in sand culture containing S-35 labelled sulphate, so that methionine, cystine, etc., were already labelled, was exposed to C-14 labelled methyl bromide. Prepared samples of wheat gluten were similarly exposed. Gluten prepared from the exposed wheat, and the exposed gluten samples, were hydrolysed in hydriodic acid to remove labile Me groups.

The hydrolysates were examined by means of starch column and paper chromatography. So far the results indicate that N-methylation occurs selectively with the significant formation of only one or two derivatives believed to be from basic amino acids. These N-methyl compounds are not, apparently, derived from the sulphur-containing amino acids, to judge from the lack of coincidence between S-35 and C-14 activity in the chromatograms.

Work carried out in collaboration with Drs. K. M. Clegg and E. Kodicek, of the Dunn Nutritional Laboratory, Cambridge, has shown that methyl bromide has no measurable effect on the vitamin B content of grain. Preliminary experiments with ethylene oxide have shown that this substance

reacts with nicotinic acid and nicotinamide in solution. Further experiments are to be made with wheat.

Methyl methionine sulphonium bromide (MSB), the principal sulphur compound formed in methyl bromide-fumigated wheat, has been examined for possible mammalian toxicity at the Cereals Research Station.

Weanling rats were fed on formulated casein diets which were respectively methionine- and MSB-deficient (control), methionine-supplemented, and MSB-supplemented. The rats grew more rapidly on either of the supplemented diets, which suggests that the growing rats are able to utilise MSB as a substitute for methionine. With the organism *Leuconostoc mesenteroides* (which has been successfully used for the bio-assay of the toxic methionine sulphoximine produced in 'Agenised' flour) MSB failed completely to replace methionine in the medium.

The Thunberg technique employing methylene blue as a hydrogen acceptor has been used for measuring the spontaneous dehydrogenase activity in muscle and nervous tissue preparations from normal and methyl bromide-poisoned cockroaches and *Calliphora* larvae. There was no evidence of inhibition.

Radioactive Tracers

Special attention has been paid to the development of radioactive tracer techniques. An active bromine analogue of DDT has been used as an indicator in work on the absorption and metabolism of DDT by normal and DDT-resistant houseflies; it has been shown that susceptible as well as resistant flies are capable of decomposing DDT provided the dose absorbed is sufficiently low, and that there is evidence of at least two different mechanisms of housefly resistance to DDT.

Adult houseflies have been fed on a mixture of dextrose and water containing 'carrier-free' P-32 labelled orthophosphate; in this way flies have been obtained in which the phosphorus-containing intermediates of carbohydrate metabolism are uniformly labelled. The normal distribution of these intermediates in muscle tissue has been determined by combined tracer-paper chromatography techniques. Experiments are in progress to determine the disturbances in glycolysis due to DDT, pyrethrins, methyl bromine and HCN.

Other lines of biochemical research being followed include the harvesting of S-35 labelled grain from wheat grown in S-35 sulphate; synthesis of Cl-36 labelled BHC; and paper chromatography of the pyrethrins and their derivatives.

'Pest Infestation Research 1952.' HMSO, 2s.

Laporte Titanium Limited

THE name of National Titanium Pigments Limited is being changed to Laporte Titanium Limited from 20 July. Recently the company became a wholly-owned subsidiary of Laporte Industries Limited and it was thought appropriate that the name should come into line with the other companies in the Laporte group by adopting the use of the founder. The address remains the same, viz., Hanover House, 14 Hanover Square, London, W.1.

The time chosen for the change of name synchronises with the production of titanium oxide from the new plant at the Battery Works, Stallingborough, North Lincolnshire.

For some time past the demand for the company's improved qualities of titanium oxide, anatase and rutile types, has much exceeded the productive capacity of the plant at Luton and this has been an embarrassment to both customers and the firm. It is expected that shortly arrears of deliveries will be overcome and then the company will be in a position to supply the total requirements of even the largest British users and to make a significant contribution to the export trade.

New Uses for Fatty Acids

AN ever increasing quantity of fatty acids are being used for industrial purposes other than soap. The reason for this is that modern production methods, such as fractionation and low temperature solvent crystallisation, permit the manufacture of pure fatty acids with new and constant characteristics. New uses for fatty acids in the chemical industry are in the manufacture of aliphatic amides, amines, ketones, quaternary ammonium compounds and other derivatives, stated Mr. M. K. Schwitzer, of the Chemical Division of Armour & Company, Ltd., speaking in Paris at the recent 26th Congress of Industrial Chemistry.

Italian Cement

Considerable Increase in Output Forecast for 1953

THE first production of cement in Italy took place in 1876 in a factory near Casale Monferrato, a locality where calcium carbonate was largely available. Since then, cement manufacture has shown a rapid progress from empiricism to a technically and scientifically advanced phase, and Italy now produces, besides the ordinary natural and artificial hydraulic lime cement (Portland), the following types:

(a) Pozzolana cement, largely employed in Italy owing to the availability of volcanic dust in several regions and endowed with particular characteristics of chemical stability and impermeability. Pozzolana is added to clinker when milling (25-35 per cent of the finished product).

(b) Blast-furnace cement, characterised by its chemical resistance and obtained by adding blast-furnace slag to clinker when milling (30-70 per cent of the finished product).

(c) Aluminous cement, produced by employing bauxite and characterised by its rapid hardening, high chemical resistance and refractory powers.

(d) Ferric cement, characterised by its high resistance to sulphates and chlorides.

(e) Pozzolana-containing ferric cement.

(f) White cements (Civitavecchia and Castellammare); owing to their white colour, they are particularly useful in the preparation of flooring tiles, artificial stone, and similar products, and constitute a valued and widely exported material.

After the second world war the recovery of this industry has been retarded by shortage of fuel and by the necessity of rebuilding the plants, mostly destroyed or damaged during the conflict. In spite of this, the 1938 productive level (4,607,600 metric tons) was exceeded in 1952 with an output of 6,821,000 metric tons.

The 91 factories in activity by the end of 1952 had an estimated productive capacity of 7,500,000 metric tons and produced 75 per cent of artificial and 25 per cent of natural cement. Sizes of establishments differ, but in the construction of new factories there is a tendency toward productive capacities greater than 10,000 metric tons a month, which will permit lower costs of production. Some plants already exceed a monthly output of 20,000 metric tons, and the new factory of Bagnoli will produce about 40,000. Out of the present 49 manufacturing concerns the largest one (Italcementi) produces alone about 45 per cent of the total output.

Italian cement, appreciated abroad because of its quality, has enjoyed good export possibilities, restricted only by the increasing demands of the national markets:

	Imports (1,000 *metric tons*)	*Exports* (1,000 *metric tons*)
1948	13,455	61,607
1949	4,480	124,056
1950	4,900	139,963
1951	6,045	221,907
1952 (eleven months)	41,660	165,255

	Total Consumption	*Increment*
1948	3,095,000	———
1949	3,964,000	869,000
1950	4,901,000	937,000
1951	5,513,000	612,000
1952	6,698,000	1,185,000

Cement factories at Augusta, Bagnoli, Catania, Ragusa, Siracusa and Trieste are being built and the Ragusa establishment will start production before long. It is possible to forecast for 1953 an increase in production of about 1,000,000 metric tons.

Imports of Agar-Agar

The Board of Trade invite applications for licences permitting the import during the year 1 July, 1953, to 30 June, 1954, of agar-agar of Japanese or Southern Korean origin consigned from Japan, Southern Korea or Hong Kong. Licences will be issued both to those who imported in the year 1952 and to those manufacturers who used agar-agar in the course of that year. Each application should be accompanied by a statement or statements certified by an independent practising accountant, and should be sent to reach the Board of Trade, Import Licensing Branch, 43 Marsham Street, London, S.W.1, not later than 25 July, 1953.

The Analysis of Cobalt

Part II—Qualitative, Continued

THE Russian workers Voznsenskii, Pazel'skii and Tsinn[32] investigated the properties of hydrorubeanic acid and its metal salts for analytical purposes. They used 1 ml. (0.25 per cent alcoholic) of hydrorubeanic acid and added it to 1 ml. of the solution under investigation. It was found that cobalt hydrorubeanate was stable at room temperature and insoluble in distilled water This method has been used for semi-quantitative work but it is not very accurate.

The tautomeric form of 1-phenyl-3-methyl-5-pyrazolone ($C_{10}H_{10}N_2O$) was found by Dubsky and Wintrova[33] to be capable of forming metallic salts with the -OH group and complex compounds with the -N-N- group. They prepared various salts, the most interesting being the $-CoI_2$ salt which is ultramarine blue and the OH-Co-I_2 salt which is dark brown.

When benzeneazo-dimethylamino-benzenesulphonic acid is added to a solution containing cobalt ions, the cobalt is precipitated in brown to black crystals which are soluble in hot water and crystallise into prisms. This method was used by Pozzi-Escot[34] as a sensitive test for cobalt.

Another method whereby cobalt is detected by a crystal-form was due to Langer.[35] Acridine had been recommended by an earlier worker for the detection of certain cations. One drop of the cobalt test solution was mixed with one drop of one per cent ammonium thiocyanate solution and one drop of one per cent acridine hydrochloric solution. The compound formed in the presence of cobalt appeared as long, green, crystals of the formula $[Co(SCN)_4]\,H_2(C_{13}H_9N)_2$. It was possible to detect 5 μg. of cobalt by this method.

Zutzelnigg's Method

A method for the detection of cobalt and separation from other metals was suggested by Zutzelnigg.[36] He studied the solubility of cobalt xanthate in various organic solvents and found that those which were chlorinated or aromatic were most satisfactory, e.g. dichloromethane (28 gm./l.) and cyclohexanone (380 gm./l.). By this means it was possible to extract the green cobalt xanthate completely from the other metals.

Wenger and Duckert[37] tried ethylxanthate as a reagent in group analysis. They divided the ions into five groups. The first contained those ions which were precipitated as chlorides, the second, those ions which were precipitated as sulphates. After removal of these two groups a number of ions which could be precipitated as xanthates, including cobalt xanthate, were examined and a useful separation achieved.

More Sensitive Solution

A paper by Cullinane and Chard[38] described the use of a solution of 0.375 gm. of 2,7-diaminodiphenylene oxide in 50 ml. of hot 10 per cent acetic acid as being more sensitive to cobalt ions than the usual solution used (benzidine in acetic acid). The blue colour produced is presumably due, as with benzidine, to the conversion of the amine to an oxidation product of quinonoid structure consisting of a molecular compound of the base with the corresponding di-imine, together with two molecules of an acid. This is a sensitive test for cobaltous ions in the presence of sodium hydroxide solution.

Dubsky[39] found that dimethylamino-hydroxyphenoxazone carboxylic acid (gallocyanine) formed red-violet solutions with cobalt ions in acids and blue-violet solutions in alkalis, and that, in dilute ammonia, in the presence of cobaltous ions, a green precipitate was formed after standing for 12 hours.

Using picrolonic acid as reagent Berisso[40] obtained a sensitivity of 1 in 10,000. The reagent was composed of 0.1 gm. of picrolonic acid in 8 gm. of ethyl alcohol and 7 gm. of distilled water. The crystalline precipitate obtained with cobaltous ions was readily distinguishable from those obtained with certain other elements (lead, calcium, strontium, manganese, iron, copper, zinc, nickel, barium, etc.).

A useful test for cobalt in the presence of nickel, or vice versa, was put forward by Pozzi-Escot.[41] He examined the nickel and cobalt dimethylphenylazobenzene sulphonates and was able to distinguish between the two by their crystal forms after crystallisation from hot water. The nickel salt formed

crystals as large rhombs while those of the cobalt salt were large needles or star-shaped clusters.

Many methods involving the use of thiocyanate have been recorded in the literature during recent years. Ryazanov[42] found that when furfuraldehyde in a saturated solution of ammonium thiocyanate was added to a solution of a divalent cobalt salt, a green colour was obtained which was perceptible in 16,000 parts of distilled water. Any iron present was precipitated with sodium pyrophosphate. The test is not effective in the presence of large quantities of bismuth ions.

Possible Reactions

Martini[43] studied possible reactions with espartine for cobalt detection. After unsatisfactory trials, he found a suitable reagent consisting of 40 gm. of ammonium thiocyanate and 5 gm. of espartine dissolved in 100 ml. of distilled water. When one drop of the reagent was added to one drop of 0.1 per cent cobalt chloride solution, to which had been added a small quantity of 20 per cent hydrogen peroxide, and the solution stirred vigorously to ensure good mixing, blue, rectangular, tabular crystals, grouped in rosettes, were formed. Microscopic examination of these made it possible to detect cobalt ions since compounds formed with ferric, vanadium and zinc ions possessed different crystal forms.

It was found by Gusev[44] that pyramidone precipitated cobalt in the presence of the thiocyanate ion. The blue precipitate formed was due to a complex of the formula $(C_{23}H_{17}N_3O)_2H_2[Co(SCN)_4]$ and was only very slightly soluble in cold water, but soluble in hot water, alcohol and ether. The precipitate was stable in air.

A very sensitive test for cobalt involving the use of the thiocyanate ion has been suggested by Potratz and Rosen.[45] They discovered that when the triphenylsulphonium ion was added to a solution containing divalent cobalt ions in the presence of excess thiocyanate ions, a blue, chloroform-soluble substance was precipitated. By extraction of the substance with chloroform, a sensitivity of 0.05 μg. of cobalt at a dilution of 1 in 10^6 was obtained. The maximum colour development occurred at *p*H 3-5. The corresponding *m*-xylyldiphenyl sulphonium compound, on analysis, was shown to have the formula $[C_6H_3(C_2H_3)_2S]_2Co(SCN)_4$. Interferences to this test are minimised by the addition of ammonium ions or by reduction with sodium bisulphite.

In the same year Okac and Celenchovsky[46] used a neutral test solution containing cobalt ions. To this they added three drops of ammonium chloride solution, one drop of 5 per cent potassium thiocyanate solution and one drop of a 10 per cent aqueous solution of antipyrine. In the presence of cobalt the chloroform layer developed a blue colour.

A series of arsonium thiocyanates was studied as possible cobalt precipitants by Dwyer, Gibson and Nyholm.[47] The blue cobalt compounds formed were found to be sparingly soluble in distilled water, but readily soluble in organic solvents such as ethyl alcohol, chloroform and acetone. The compounds have the general formula $(R_4As)_2Co(CNS)_4$ and melt sharply to blue liquids. As the molecular weight of the arsonium radical was increased the solubility decreased.

The sensitivity of the reaction, when applied to the detection of cobalt, increased with molecular weight and the maximum sensitivity was obtained with tri-*p*-tolylmethylarsonium thiocyanate which could detect as little as 0.34 μg. of cobalt per ml. Iron interfered, but the interference could be suppressed by the addition of either sodium ammonium phosphate or sodium fluoride prior to the addition of the arsonium thiocyanate. Cobalt may be detected in the presence of large amounts of nickel or small amounts of iron by extraction of the arsonium cobalt thiocyanate with chloroform. Amounts of cobalt of the order 0.3-0.5 μg. per ml. could be detected by this method.

Interesting Reviews

Several interesting reviews on the detection of cobalt with organic reagents have been compiled, among which is one by Thomson and Thomson[48] who make use of their practical experience in recording details of certain of the better known reactions of cobalt, e.g. with 1-nitroso-2-naphthol, rubeanic acid, or biacetyldioxime.

Wenger, Duckert and Bussett[49] have given a review of reactions recommended by the International Commission for Reactions and Reagents. Briefly, they listed three classes of test: (a) microscopic tests, (b) spotplate tests and (c) test tube reactions. Only a very brief summary of the reactions listed

will be included, as details of many have already been given.

(a) Tests under microscope:—Caesium chloride and potassium nitrate in acetic acid.

(b) Spot tests:—1-nitroso-2-naphthol, 2-nitro-1-naphthol, hydrorubeanic acid, potassium thiocyanate, benzidine, formaldoxime, dimethylglyoxime and benzidine.

(c) Test tube reactions:—Caesium nitrate and potassium or sodium nitrate, ammonium mercurithiocyanate, potassium thiocyanate, potassium oxycyanate, benzidine, eriochrome red B(G), dark blue eriochrome B(G), formaldoxime, dimethylglyoxime and benzidine.

Other reviews on steel analysis include many of the reactions mentioned for the detection of cobalt in steels. Piggott[90] has written an extensive review along these lines which deals solely with the use of organic reagents.

Detection with Inorganic Reagents

Of the many methods available for the detection of cobalt, comparatively few involve the use of inorganic reagents. These reagents are, however, none the less important.

Duval and Soye[83] described conditions for the microanalytical detection of trivalent cobalt as the yellow potassium cobaltinitrite salt $K_3[Co(NO_2)]_6$. The limit of dilution was 0.5×10^{-6} and the absolute sensitivity was 0.04 μg. of cobalt. Nickel did not interfere and ferrous, ferric, chromate and vanadic ions only interfered when present in a ratio greater than 100: 1.

The ordinary spot plate is not suitable for detecting very small quantities of a precipitate. For detecting cobalt (and copper and nickel) by means of the ammonium mercurithiocyanate or potassium selenocyanate in the presence of a zinc salt, Thomson[52] found a capillary of 0.2-0.6 mm. diameter to be satisfactory. The cobalt test solution was introduced into the capillary mixed with an equal volume of reagent solution and centrifuged. By means of a hand lens, very small quantities of precipitate were visible. As little as .001 μg. of cobalt could be detected using either reagent. Gramacho[53] preferred a microscope for detecting the precipitate.

The crystal form and colours of the pure compounds of bivalent cobalt with mercurithiocyanate anions were described and illustrated by Stahl and Straumanis.[84] They found that more sensitive tests could be obtained using pure, solid ammonium mercurithiocyanate. With the simultaneous precipitation of zinc and cobalt ions or cadmium and cobalt ions, the crystals obtained are deeper in colour and less soluble in distilled water, hence the reaction is very sensitive.

It is probable that in concentrated hydrochloric acid solution cobaltous chloride ($CoCl_2$) forms a complex of the type $HCoCl_3.nH_2O$. Rossi[85] investigated this and found that the blue cobalt complex would adsorb the compound formed by treating potassium ferricyanide in the cold with hydrochloric acid and then oxidising. He found that if a microdrop of 0.1M potassium ferricyanide was placed on a filter paper and a microdrop of 0.1M cobalt chloride ($CoCl_2.6H_2O$) solution was added, and then pure, dry, hydrogen chloride gas passed over it, the initial blue colour became violet blue, which deepened in time. Nickel gave a slightly greenish colour. Cobalt and hydrogen chloride gas in the absence of potassium ferricyanide gave a blue colour that faded as soon as the hydrogen chloride was removed. Ten μg. of cobalt could be detected by this method.

Koreman and Ashbel[86] suggested three possible, simple, reactions for the detection of cobalt. They added 2-3 ml. of concentrated hydrochloric acid to 1 ml. of test solution and obtained the usual blue colour. Excess of iron, copper and nickel interfered. The second reaction took place when ammonium chloride or potassium chloride was added to 1 ml. of weakly acid (hydrochloric) test solution and the mixture boiled. An insoluble residue of the reagent remained which, in the presence of cobalt, became blue. Excess of iron and copper hindered the reaction.

Most Effective Reaction

Their final and most effective reaction involved the use of one drop of 1 per cent copper sulphate solution added to 1 ml. of weakly acid (hydrochloric) test solution. This was then saturated with crystals of sodium thiosulphate, a few crystals being added in excess. An equal volume of ethyl alcohol was added, when the thiosulphate precipitated and became blue in the presence of cobalt ions. Excess of iron and copper did not interfere with the reaction.

Caron and Raquet[87] examined the reactions of sodium thiosulphate solutions and were able to show that while they did not react

in the cold with divalent cobalt ions, a spot test was obtained by adding a crystal of sodium thiosulphate ($Na_2S_2O_3.5H_2O$) to a drop of the test solution. The test was capable of detecting 0.02 mg. of cobalt at a dilution of 1 : 2,500. The crystal was coloured blue. Mercury, bismuth, antimony, tin and silver also reacted with the crystal; arsenites interfered when present in excess and chromium salts caused difficulty because of their colour. These interferences apart, this is an invaluable test for cobalt.

Less Sensitive Test

A somewhat less sensitive test, capable of detecting 0.05 mg. of cobalt in 1 ml. of solution was suggested by Gordon and Schreyer.[38] The reagent is, however, very inexpensive and so renders the method a useful one. These workers found that when divalent cobalt ions were added to an excess of saturated alkali hydroxide solution, a compound of the formula $Co(OH)_2.(H_2O)_4$ was formed which dissolved to form ions of the type $[Co(OH)_4.(H_2O)_2]''$ resulting in a blue colour.

Deniges[39] described a microchemical technique for the rapid detection of traces of cobalt. He placed about 10 mg. of substance in a capsule and added 0.5 ml. of nitric acid and heated gently; as cobalt nitrate formed the liquid turned pink and then deepened to purple on evaporating. The dry residue was dispersed in 0.2 ml. of water (Solution A) and one drop was transferred to a slide by means of a glass rod. One drop of sulphuric acid (1 : 3) was added and heated gently to dryness; hexahedral, pink crystals could be seen under the microscope.

To the rest of solution A 2 ml. of distilled water was added and distributed into four different test tubes. To I, three volumes of concentrated hydrochloric acid was added, when a blue green colour appeared; to II, one volume of saturated potassium thiocyanate solution was added, when a violet-blue colour developed and spectrographic analysis showed typical adsorption in the orange and blue green. To III and IV, one volume of a solution prepared from 5 per cent tannic acid was added, half as much ammonium hydroxide solution and a few drops of 5 per cent potassium ferrocyanide solution. A red precipitate was given with the former and a green precipitate with the latter. This series of tests is useful for detecting cobalt when only small amounts of sample are present.

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(To be continued)

Visit to Colne Valley Works

AT their summer meeting on 3 July the members of the South East Section of the Institution of Water Engineers inspected the new works being constructed by the Colne Valley Water Company, Watford, Herts.

The works inspected were the Bricket Wood pumping station—one of three new pumping stations in the course of construction—the Hilfield Park reservoir and the Clay Lane treatment works.

The reservoir, which will have a capacity of 540 million gallons, is the first large open reservoir to be constructed for storing raw water pumped from chalk wells. The Clay Lane treatment works will be capable of purifying 24,000,000 gallons a day by the most modern methods.

In addition to the foregoing works, the construction of a 25,000,000 gallon covered reservoir to hold treated water will be commenced in the near future. It is anticipated that the new works will together cost £2,750,000.

When the Colne Valley Company came into existence some 80 years ago the population served was under 9,000. The population now exceeds 550,000 and requires a daily average supply of 23,000,000 gallons.

Carbon in Chemical Engineering

Heat Exchangers Manufactured by the Morgan Crucible Co., Ltd.

MANY problems in chemical engineering are being solved by the use of carbon or graphite and the Morgan Crucible Co., Ltd., manufacture numerous varieties of carbon and graphite, each of which possesses the most suitable combination of properties for particular applications. Practically every property of carbon can be altered except the specific heat, which remains constant at about 0.2.

Among the characteristics which can be developed to a varying degree, depending on the particular combination which is most desired, are: wide range of resistance to chemical attack, low reversible thermal expansion, good mechanical strength at high temperatures, high resistance to thermal shock or steep temperature gradients, high thermal conductivity of graphite or relatively low thermal conductivity of carbon, not wetted by molten metals, good electrical conductivity, availability in impervious forms, machinability, self-lubrication and high resistance to wear.

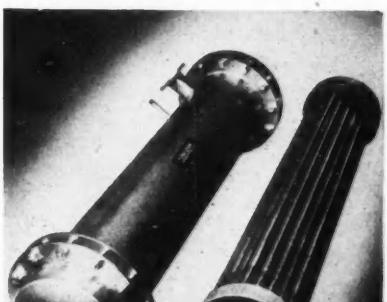
Superior Resistance

Since the resistance of graphite to chemical attack is superior to that of all metals except those which are very costly, and having regard to its high coefficient of thermal conductivity—which is better than that of most metals—it is evident that carbon has considerable possibilities for heat exchangers which handle corrosive fluids. Carbon heat exchangers are quite a recent development, for they have only been manufactured in Britain since the war. They are produced in an impervious graphite known as 'Carbinert,' which has exceptional resistance to corrosion and a high rate of heat transfer.

Two distinct forms of this material are available. One type is capable of withstanding general acid and mineral acid conditions, but is not resistant to solvents. The other form has excellent acid resistant qualities, but it will not stand up to nitric acid and is less impervious to highly oxidising conditions; on the other hand, it is extremely resistant to organic solvents, e.g. trichloroethylene, chlorobenzene and carbon tetrachloride.

The mechanical properties of 'Carbinert' are good. Tubes constructed of this material have ultimate strengths of 3,800 lb. per sq. in. (transverse), 5,500 lb. per sq. in. (compressive), 1,000 lb. per sq. in. (tensile) and 1,200 lb. per sq. in. (shear). They have an elastic modulus of 0.5×10^6 lb. per sq. in. and a specific resistance of 5×10^{-4} ohms per in.^{3}. The specific gravity is 1.8, the Shore hardness 45, and the thermal conductivity 60 B.Th.U./hr./sq. ft./°F./ft.

While the compressive strength of 'Carbinert' is excellent, the tensile strength, though adequate, is less than that of many other materials in common use, and care must be taken to ensure that the material is not put under unnecessary tension. When designing heat exchangers it is therefore essential that adequate provision should be made for the effects of differential thermal expansion. The tensile strength of the material is sufficiently high, however, to enable internal pressures to be handled, and all tubes are subjected to an internal hydraulic test pressure of 100 lb. per sq. in., while a proportion are tested to destruction. For tubes 1¼ in. bore and 2 in. o.d., the usual bursting pressure is between 400 and 500 lb. per sq. in., and no seepage takes place through the pores of the material even at



A two pass shell and tube exchanger

the maximum available pressure of 500 lb. per sq. in.

Generally speaking, carbon heat exchangers are finding increasing favour for applications where hard rubber or ebonite could not be used and neither lead nor glass enamel linings would be satisfactory. They are giving dependable and economic service in conditions where formerly adequate performance could only be obtained by the use of very costly materials. An example of the economies which can be effected by installing carbon exchangers is afforded by a unit constructed of this material, which was installed at a works in which lead exchangers were formerly employed. It occupies about a third of the space and is very much cheaper to maintain. It is obvious, too, that higher pressures and hence higher temperatures can be handled with a carbon unit, though the operation of carbon heat exchangers at temperatures much above 90° is not recommended by the manufacturers.

Four different types of carbon heat exchangers are made by the Morgan Crucible Company, namely shell and tube or bundle type units, cascade coolers, plate heaters, and bayonet heaters.

Shell and Tube Type

The greatest demand is for heat exchangers of the shell and tube type, the largest and most popular of these units having 44 tubes each 1¼ in. o.d., ¼ in. i.d. and 6 ft. long. The tubes are bonded by means of sealing ferrules into 15¾ in. dia. end plates of impervious graphite. The entire nest of tubes is enclosed in a mild steel shell with steel end domes, the latter being either rubber or lead-lined according to individual requirements.

The capacity of a 44-tube unit depends, of course, on a number of factors, but under a specific set of conditions—for example, in acid heating—it might be of the order of 2,500,000 B.Th.U. per hour. The overall coefficients obtained with a unit of this type, which can be used on very dirty solutions, is in the region of 300 B.Th.U./hr./sq. ft./°F.

Heat exchangers of the shell and tube type have several important advantages. In the first place, the pressure drop is very low compared with that of any other type of heat exchanger. The construction makes it impossible for any chance intermingling of the heating medium and the acid to take place, while the unit is not prone to internal leakage trouble. Shell and tube type exchangers are available either as single pass or as two pass units. Under certain conditions it is possible to arrange them to give four passes.

Acid Heating Duty

These units are extensively used for any acid heating duty, with the exception of applications involving intensely oxidising acids such as strong nitric, strong sulphuric or chromic acids, which the materials cannot resist. The numerous applications into which they can be incorporated include such processes as the heating and cooling of rayon spin bath solutions, heating of steel pickling solutions, and the cooling of hydrochloric acid gas before absorption.

The tube bundles can be mounted either vertically or horizontally, but mounted in the former position they give a slightly better performance. Multiples of the tube bundle are available as heating elements for evaporators, and they are also used as condensers and as true liquid interchangers. In the last application the shell itself is protected and the nest is usually fitted with carbon baffles.

'Carbinert' cascade coolers are used for cooling both corrosive liquids and gases, typical applications being the cooling of hydrochloric acid and chlorine. Four types are available, namely single path in series, two paths all in series, three paths all in series, or four paths all in series. The arrangement of any particular installation can be modified or adapted to produce ideal flow conditions. The manufacturers consider that the liquor should flow through the graphite tubing at not less than 3 ft. per second, and if there is any tendency for scale formation speeds of 5 or 6 ft. per second are allowed for.

The cascade cooler is built from standard parts and each unit is separately gasketted to its neighbour, while the whole series is fastened by tiebars which hold the individual units in compression on the gaskets. Units of this type have advantages over bundle heat exchangers where a small quantity of acid has to be cooled through a large temperature range. The overall coefficients from liquid to liquid are of the order of 100 to 200 B.Th.U./hr./sq. ft./°F. For gas cooling the coefficients are obviously much lower. Another advantage of the cascade

cooler is its construction, which makes it possible to replace a unit so quickly in the event of breakage that the plant can be put back into operation within perhaps a couple of hours.

Plate heaters are made in sizes up to 3 ft. 10½ in. long by 10½ in. wide by 4 in. thick, in the form of a block which is internally machined to give a series of convolutions to carry the steam. The usual number of convolutions is four. Generally speaking, units of this type are made in two halves, each of which has a series of half convolutions machined out of it, the halves being cemented together. The outside surface is ribbed to increase the surface area. By means of suitable tubes any number of these units can be joined in parallel, arranged horizontally or vertically.

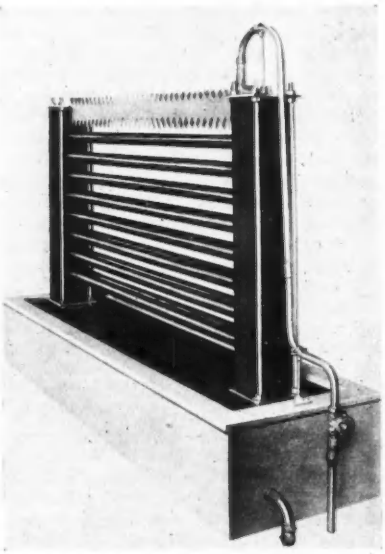
Plate heaters are suitable for acid heating, and they can be used at steam pressure up to 40 p.s.i. Because of their robust construction they are particularly recommended for pickling tanks subjected to rough usage.

Finally, there is the bayonet heater, which is intended primarily for heating small tanks or containers. It consists of a flanged, blanked off tube, which can be bolted to a flange on a tank, and may be mounted either vertically or horizontally. It can have either steam or water running through it. The main uses for bayonet heaters are for heating or cooling very small tanks in batch processes.

Since many forms of carbon can be machined to very close tolerances, it is possible to produce from these materials a variety of components for use in chemical engineering plant. Large numbers of machined carbon components are already in use and the development of complete plant items such as pumps is well advanced. Both permeable and impervious forms may be used for the production of machined components, depending on the combination of properties desired.

Improving Certain Duties

If necessary, a particular property can often be improved, but this is usually accomplished at the expense of some other property. For example, graphite blocks can be produced with a thermal conductivity of 80 B.Th.U./hr./sq. ft./°F./ft., but the mechanical strength will then be slightly lowered. Similarly, the tensile strength of graphite tubes can be raised to over 3,000 lb. per sq. in., but the thermal conductivity will be reduced to 22.5 B.Th.U./hr./sq. ft./°F./ft.



A cascade cooler

Carbon bearings owe their industrial importance primarily to their self-lubricating property, but their chemical inertness and their resistance to heat are equally desirable for many purposes. In fact, most applications are for exacting conditions where chemicals, steam or high temperature prohibit the use of ordinary lubrication. Carbon bearings have many uses in chemical plant and fuel pumps.

Because of its chemical and wear resistant properties, carbon is used for the production of nozzles for the injection of liquids or gases. Another very useful application is in the construction of carbon steam ejectors. Carbon pipes, flanges and cocks are being fitted to many vessels, particularly those which have been lined with other forms of carbon. A logical development is the production of complete carbon systems, including tees, elbows, bends and pumps, and rapid progress in this direction is being made.

Reaction chambers manufactured from impervious carbon are particularly suitable for exothermic processes where the heat

transfer properties can be utilised. In special cases, such as the absorption of hydrogen chloride, they can be effectively water cooled to keep the temperature within the required limits. Another interesting application is the construction of carbon rollers for use in the continuous pickling of steel strip.

Carbon granules form an excellent filter bed for corrosive liquids, being particularly suitable for applications where hydrofluoric acid or caustic alkalis are present. A special porous grade combining rigidity and chemical inertness has been developed. Blocks or tubes of this material can readily be built into a wide variety of plants and can also be used for gas dispersal.

Widespread Interest

The refractory properties of carbon are primarily of interest to iron and steel works, but they are also of value in the chemical and metallurgical fields. For example, boats, moulds and tubes of carbon or graphite are used at extremely high temperatures in the preparation and sintering of tungsten carbide.

Because of its wide range of resistance to chemical attack, carbon has obvious applications as a lining material for chemical plant, for which purpose suitable grades have been made available at low cost, together with cements and mortar which are almost as resistant as the carbon bricks. In fact, the only types of reagent that normally attack the joints and not the bricks are aromatic solvents and chlorinated hydrocarbons. Physically, carbon is an ideal material for linings because of its very good resistance to abrasion.

So far the largest application for carbon linings in Britain has been in steel works, where many problems are presented by the increasing use of hydrofluoric acid for pickling. With carbon these problems are easily solved, because a passive film appears to be formed which increases the resistance of the cement to oxidising conditions. For instance, at 70°, 30 per cent nitric acid rapidly attacks the cement, but if as little as 5 per cent of hydrofluoric acid is added to the mixture the cement is unaffected. Thousands of tons of carbon bricks and tiles are supplied every year to the sulphite pulp industry, particularly in Scandinavia, for use in digesters. For applications of this nature carbon has proved most successful.

Chemical Expansion in Israel

THE Israeli Minister of Finance recently announced that the development department of his ministry had completed a twenty-year 'master plan' for the use of the country's mineral resources in creating a chemicals industry that would become 'the cornerstone of Israel's industrial structur

One of the first steps will be to build a calcination plant employing a partly chemical process to raise the phosphate content of Israeli ores and 'enhance their ability to compete on world markets.' An enrichment plant using crushers and sifters is already operating.

Other plants processing phosphates and perhaps other minerals will be built in the vicinity of Kurnub, on the road from Beersheba to the phosphate mines and to the Dead Sea potash works. Housing for workers is to be built at Kurnub.

The plan includes a progressive expansion of the potash works and the installation of a smelter at the copper mines north of Elath (Aqaba). Exploitation of gypsum, ball clay and silica will be encouraged. To reduce transportation costs the railroad network will be extended to Beersheba and Kurnub. Surveying for the new lines has been completed and construction is to begin within a year.

Fertiliser Requirements

The Minister of Materials, Sir Arthur Salter, was asked recently in the House of Commons by Mr. P. Hurd whether, in view of the decision to free fertilisers from control from 1 July, he would give an estimate of prospective supplies. The Minister replied that the supplies of fertilisers available next season were expected to be sufficient to meet the requirements estimated by the Minister of Agriculture. Those requirements were for phosphatic fertilisers having a phosphoric acid content of 400,000 tons, potassic fertilisers having a potash content of 210,000 tons and nitrogenous fertilisers having a nitrogen content of 235,000 tons. It was estimated that the use of fertilisers for the season ended 30 June would show an increase of 8 per cent and 10 per cent, respectively, for nitrogen and potash over the average of the past three years, with no change for phosphates.

German Export Recovery

Leading Chemical Companies' Better Sales

THE experience of German chemical manufacturers in the export field so far this year has been rather more favourable than that of British exporters. German chemical exports are once again running at the high 1951 levels, the sales losses of last year having been wiped out almost completely. While it is too early to say whether this favourable trend will continue during the second half of the current year, German chemical firms view the future with confidence.

The export improvement is largely due to larger sales to dollar markets. The USA absorbs larger quantities of heavy chemicals, nitrogen fertilisers and chemical fibres from Germany. More potash salts, pharmaceuticals and dyestuffs were sold to Asiatic countries. Trade with Germany's European neighbours, on the other hand, is less satisfactory, with the not unwelcome result that Europe, which formerly took two-thirds of all Germany's chemical exports, now plays a less dominant part. The decline in sales to European countries is stated to be partly due to Germany's continuing surplus within the European Payments Union.

German potash sales have increased since discounts for summer delivery came into force. Earlier, however, short-time work was the rule rather than the exception in the important producing area of Lower Saxony. Now that stocks have been reduced, it is hoped to keep production in line with sales without further recourse to short-time work. Leading producers hope that exports will increase further and that total production this year will be higher than last year. Exports of salt produced by potash mines as a by-product have recently declined.

Satisfaction Expressed

Two of the major I.G. Farbenindustrie successors have expressed satisfaction at the course of trade so far this year. Farbenfabriken Bayer AG, Leverkusen, announced at a Press conference that sales have developed satisfactorily since the setback due to the textile slump last year and that 'a good profit' was anticipated for 1953. In comparison with the 1952 average, Farbwerke Höchst AG, Frankfurt, achieved a 15 per cent increase in sales during the first half of this year. For the whole of 1953 the company's increase over last year's turnover of DM.760,000,000 (including fully-owned subsidiaries) may be smaller as usually the second half of the year is less favourable than the first, owing to seasonal factors.

Farbwerke Höchst AG spent DM. 92,000,000 on new investments last year and expect that investment expenditure this year will be around DM.80,000,000. The perlon factory at Bobingen is to be enlarged, and substantial sums are to be invested in petroleum chemicals plant. The carbide chemistry and phosphorus compounds fields are others in which appreciable investments are envisaged. This one I.G. Farbenindustrie successor company annually spends on research about DM.30,000,000, i.e. about four per cent of the proceeds from sales.

Leading perlon producers report that the demand for continuous filament perlon can still not be met, while sales of perlon staple are described as less satisfactory. The total perlon production is still rising, and new plant is being built. The production of nylon was started by Deutsche Rhodiaceta AG but is still comparatively small. The production of rayon, which fell from 182,000 tons in 1951 to 139,000 tons in 1952, recovered slightly in the early part of this year. The leading producer is now operating his rayon staple capacity at about 85 per cent.

Detergents Inquiry

REFERENCE was made in the House of Commons recently to the work of the committee appointed by the Minister of Health and Local Government to inquire into the possible ill-effects of the increasing use of synthetic detergents. Mr. Gower asked Mr. Ernest Marples, Parliamentary Secretary to the Minister, whether he was aware that the matter was one of real urgency in some parts of the country and will he see that the inquiry was speeded up.

Mr. Marples said the inquiry, which was being carried out by experts, was a complex one, but a conclusion would be reached as quickly as possible.

Prices of Oils & Fats

Reductions Announced by Minister of Food

THE Minister of Food, Major the Rt. Hon. Gwilym Lloyd-George, has announced that the following reductions will be made in the prices of oils and fats allocated to the trade during the periods stated:—

PRICES OF CRUDE OILS AND FATS TO PRIMARY WHOLESALERS AND LARGE TRADE USERS DURING THE FOUR WEEKS WHICH BEGAN 12 JULY

Coconut oil	Crude and crude oléine	from	£132	to £123	Per ton naked ex-works
Palm kernel oil	Crude and crude oléine	„	£130	„ £121	
Cottonseed oil	Crude	„	£137	„ £132	
	Washed	„	£145	„ £140	
Groundnut oil	Crude	„	£148	„ £143	
Sunflower oil, Sesame/Benniseed oil, Maize oil, Soya bean oil	Crude	„	£145	„ £140	
Herring oil	Crude	„	£75	„ £69	Per ton naked ex-store
Seal oil	Crude	„	£75	„ £69	
Whale oil	Crude—No. 1	„	£80	„ £74	
	No. 2	„	£75	„ £69	
Whale/herring/seal oil	Crude hardened—up to 42	„	£92	„ £85	Per ton naked ex-works
	46/48	„	£93	„ £86	
	50/52	„	£94	„ £87	
	54	„	£94/10	„ £87/10	
	Iodine value 3/5	„	£94/10	„ £87/10	
Cotton—Black grease		„	£35	„ £30	

(*N.B.*—The Ministry no longer has supplies of good gut, medium gut, low gut and no-colour tallow.

PRICES OF REFINED OILS TO PRIMARY WHOLESALERS AND LARGE TRADE USERS DURING THE EIGHT WEEKS WHICH BEGAN 12 JULY

Coconut oil	Refined deodorised	from	£143	to £133	Per ton naked ex-works
	Refined hardened deodorised	„	£150	„ £139	
Palm kernel oil	Refined deodorised	„	£140	„ £130	
	Refined hardened deodorised	„	£147	„ £136	
Cottonseed oil, Sunflower oil, Sesame/Benniseed oil, Soya bean oil, Maize oil	Refined deodorised	„	£159	„ £154	
Groundnut oil	Refined deodorised	„	£164	„ £159	
	Refined hardened deodorised—to 40	„	£177	„ £171	
	50/52	„	£178	„ £172	
Palm oil	Refined deodorised	„	£95	„ £87	
	Refined hardened deodorised	„	£104	„ £98	
Whale oil	Refined hardened deodorised—up to 42	„	£97	„ £91	
	46/48	„	£98	„ £92	

(*N.B.*—The Ministry no longer has supplies of Empire stearine.

Chemical Plant Conference

AT the Chemical Engineering Conference, which is to be held at Olympia, London, at the time of the Chemical Plant Exhibition, 7-11 September, the following papers will be presented: — 'Carbon and Graphite as Materials of Construction for Chemical Plant,' by A. W. Morrison, B. W. Freedman and P. G. R. Haines (Powell Duffryn Carbon Products, Ltd.); 'Tantalum and Zirconium—Production and Properties,' by Dr. G. L. Miller (Murex Limited); 'Developments in the Production of Chlorine, with Special Reference to Mercury Cells,' by L. R. Thomas (Monsanto Chemicals Limited); 'Recent Advances in Milk Processing Plant,' by J. E. F. Renton (George Scott & Son (London), Ltd.); 'Recent Developments in Evaporation, with Particular Reference to Heat Sensitive Liquids,' by B. N. Reavell (Kestner Evaporator and Engineering Company, Ltd.); 'Recent Advances in Distillation,' by G. A. Dummett and Dr. P. V. Clifton (The A.P.V. Company Limited); 'The Production of Formaldehyde from Methanol by the Silver Catalyst Process,' by K. Nickels (Burnett & Rolfe Limited); and 'Recent Developments in the Application of Plastics to Chemical Plant,' by Verney Evans (Prodorite Limited).

HOME

Summer Vacation

The offices and laboratories of Dr. M. A. Phillips and Associates, consulting chemists and chemical engineers, Romford, Essex, will be closed for the summer vacation from Monday, 27 July, to Wednesday, 5 August.

Atomic Power and the Fuel Industries

The Minister of Fuel and Power, Mr. Geoffrey Lloyd, answering a question in the House of Commons by Mr. E. Shinwell, said recently that at the present stage there was not enough knowledge on which to base a precise assessment of the effect of nuclear energy on the fuel industries, but the earliest application was likely to be in the generation of electric power.

Chemical Engineering Course

The West Ham College of Technology, Romford Road, West Ham, E.15, has issued a brochure setting out its comprehensive schemes of training in chemical engineering, which are designed to meet the needs of students at all usual levels of attainment. Copies of the brochure are obtainable on application to the principal, Dr. E. A. Rudge.

Whitby Potash

A report by Mr. J. Hughes, of Wilton (Yorkshire) who is responsible for the technical developments in connection with the deposits of potash in the Whitby area of Yorkshire, states that there are enough deposits of potash to serve the needs of Britain for about 200 years. The deposits, however, are about 4,000 feet below the surface or considerably deeper than in other parts of the world. Efforts to bring the potash to the surface as a solution from a series of brine wells have not been successful and other ideas are being considered.

The Chemical Club

The Chemical Club premises at 2 Whitehall Court, London, S.W.1, will be closed on the evening of 31 July and will be reopened on 20 August. The secretary, Mr. W. H. Langwell, has announced that the committee would welcome gifts of books which members have found interesting and for which they have no further use.

Chemical Society Library

From 16 July to 30 September the library of the Chemical Society will be open from 10 a.m. to 5 p.m. daily, except during the fortnight 3-15 August inclusive, when it will be closed for revision and cleaning.

CRL Open Days

Work in progress at the Chemical Research Laboratory at Teddington, Middlesex, can be seen during a series of Open Days to be held from Tuesday to Friday, 22-25 September. The first session will be from 2.30 p.m. to 5.30 p.m. on Tuesday, 22 September; the others 10 a.m. to 1 p.m. or 2.30 to 5.30 p.m. on Wednesday, 23 September and Friday, 25 September. Applications from industrial firms for invitations to the sessions should be sent to the Director before 31 August. Firms already on the mailing list need not re-apply.

Their 'Day Out'

One thousand employees of Oldham & Son, Limited, battery and mine lighting equipment manufacturers, Denton, Manchester, recently had 'a day out,' going in two special trains to Blackpool. Each received from the board a free lunch voucher, a drink ticket and free tickets for the Tower and the Winter Gardens—together with a £1 note as a Coronation gift. They were given a civic reception and luncheon in the Spanish and Baronial Halls.

Sales Conference

Main sessions at a sales conference recently held by George Kent, Ltd., at Luton, were devoted to a detailed technical and commercial study of the new 'KU' flow meter. Sales representatives of the company, overseas branch company executives, and agents received a point-by-point briefing on the outstanding technical advantages of this new instrument. Commander P. W. Kent, R.N. (retd.), chairman and joint managing director of George Kent, Ltd., was in the chair at the conference and the following countries were represented:—Australia, South Africa, Malaya, France, Belgium, Holland, Ireland, Sweden and Austria, as well as all areas of the United Kingdom.

OVERSEAS

German Steel Output

During the first six months of this year, German steel output totalled nearly 8,000,000 tons, this being slightly more than during the first half of last year but somewhat lower than during the second half of 1952.

French Aluminium

A 20 per cent increase in turnover and a 10 per cent increase in exports were reported at the annual meeting of the Pechiney Company, manufacturers of chemical and electrometallurgical products, who are the largest aluminium producers in France.

USA Titanium Laboratory

An industrial laboratory devoted exclusively to titanium research and development —claimed to be the first of its kind—has been opened by Mallory-Sharon Titanium Corporation at Niles, Ohio. It includes a complete chemical laboratory, metallographic and spectrographic equipment, mills for hot rolling test specimens, furnaces for heat treating and melting, and an X-ray diffraction unit, in addition to normal laboratory test equipment.

Steel Output in Australia

There was marked improvement in steel production in Australia during the year ended 31 May. During that period Broken Hill Proprietary Company's output of pig-iron was 711,000 tons (against 658,000 tons the previous year) and of steel ingots 929,000 tons (against 797,000 tons).

Cement in Bahia

From Brazil it is reported that Cimento Aratú S.A. has started the manufacture of cement in Bahia, with a daily output of 8,000 bags.

Canadian Cement Deliveries

Shipments to customers by Canadian manufacturers of Portland cement in April rose to 1,971,345 barrels as compared with 1,576,376 in the corresponding month last year, raising the cumulative total for the first four months of the year to 5,990,204 barrels as compared with 5,103,097 in the like period of 1952. Stocks at plants and warehouses at the end of the month came to 1,509,635 barrels, as compared with 1,454,539 a year ago.

Pakistan Penicillin

A Karachi company has received permission from the Pakistan Government to manufacture penicillin and streptomycin. The plant will be set up in collaboration with foreign manufacturers and will go into production in about two years.

Natural Gas in British Columbia

Exploratory drilling in North-east British Columbia has resulted in a natural gas recovery rate 'almost unparalleled in North America,' according to a statement made by Mr. G. L. McMahon, president of Pacific Petroleums, Ltd.

New Vancouver Refinery

Designed to process Alberta crude oil which will begin flowing to British Colombia by pipeline within a few months, a $10,000,000 refinery plant is to be erected at Vancouver for Standard Oil of British Columbia.

Argentine Oilfield

The Yacimientos Petroliferos Fiscales (State Oilfields), of Argentina, has announced the discovery of a new oilfield in the Province of Mendoza, south-east of Tupungato, near the River Piedras Coloradas. Output is estimated at between 150 and 200 cu. metres daily.

Pakistan Soda Ash Factory

The soda ash factory at Khewra, Pakistan, has been acquired by Imperial Chemical Industries, Ltd., from the Alkali and Chemical Corporation of India, in which I.C.I. owns indirectly 70.7 per cent of the equity.

More Rubber Produced

The Rubber Study Group Secretariat announced last week that world rubber output in May rose to 142,500 tons. This is the highest amount since January, when it was 165,000 tons, and compares with 132,500 tons in April.

Bauxite Licence to be Surrendered

It is reported from Kingston, Jamaica, that the British Aluminium Company Limited proposes surrendering the exclusive prospecting licence granted to it last year in respect of bauxite in an area in St. Catherine. This is stated to be because insufficient high-grade bauxite has been found in the area to justify large-scale mining operations.

· PERSONAL ·

MR. S. P. CHAMBERS, a deputy chairman of Imperial Chemical Industries, Ltd., has been appointed chairman of a committee set up by the Government to inquire into London Transport. Credited with the invention of PAYE, Mr. Chambers, who was formerly a Commissioner of Inland Revenue, joined I.C.I. as finance director in 1947.

MR. C. F. BISHOP, who, on account of advancing years, has resigned from the board of Thos. W. Ward Limited, will, however, remain with the company, of which he has been a director since 1937.

The pharmaceutical Society's delegates to the Paris meeting of the Federation International Pharmaceutic in September will be the president, MR. T. HESELTINE, and vice-president, MR. ERIC BROCKLEHURST; MR. DONALD HUDSON, MR. A. D. MACDONALD and MR. F. C. WILSON, members of Council; MR. F. W. ADAMS and SIR HUGH LINSTEAD, joint secretaries; and MR. H. S. GRAINGER, pharmacist at Westminster Hospital.

MR. J. G. WINDOW has been appointed sales manager of the Pipe Line and Industrial Glassware Division of James A. Jobling & Co., Ltd., of Sunderland, the manufacturers of 'Pyrex' brand glassware.

MR. P. E. TRIER, M.A., and MR. G. KNOTT, M.A., A.M.I.E.E., have been appointed joint managers of the Mullard Research Laboratories. Mr. Trier will direct the electronics laboratory and be responsible for work in the fields of communications, radar, special circuit techniques, particle accelerators, special components and materials, valve applications, ultrasonics, and metal physics. He will also act in the capacity of plant head. Mr. Knott will continue to direct the work of the Mullard Vacuum Physics Laboratory and will be responsible for VHF valves, gas discharge tubes and photo-electric devices.

MR. W. S. KNIGHT has resigned from the board of Lightalloys Limited and MR. K. C. T. MARSHALL has been appointed managing director.

MADAME JOLIOT-CURIE, well-known atomic scientist and Nobel Prize winner, has been awarded the Albert of Monaco prize of 300,000 francs by the French Academy of Science as 'a feeble mark of gratitude for her discoveries in nuclear physics and chemistry, and her scientific works known to the physicists of the whole world.'

The Ramsay Memorial Fellowships Trustees have made the following awards of new Fellowships in chemistry for 1953-54:—MR. G. T. ROGERS, a British Fellowship of £500 a year at the University of Cambridge; MR. B. I. PARSONS, a Canadian Fellowship at the University of Oxford; MR. SANTOS AMER, a Spanish Fellowship at the University of Bristol; MR. GINES GUZMAN, a Spanish Fellowship at the University of Oxford; MR. R. H. DOREMUS, a USA Fellowship at the University of Cambridge. The Trustees have renewed the following Fellowships for the same year:—DR. G. H. R. SUMMERS (British Fellowship) at the University of Cambridge; DR. R. F. WEBB (British Fellowship) at the University of Cambridge.

Styrene Products Limited announce that by agreement with Erinoid Limited, MR. DAVID R. CRABTREE has relinquished his position with the sales department of Erinoid Limited to become the technical service manager of Styrene Products Limited.

MR. J. ROY GORDON has been elected a director of the International Nickel Company of Canada, Limited.

The late MR. JOSEPH TWISS, formerly managing director of the Manchester Chemical Company, left £48,328.

SIR JOHN KEAY has been elected chairman of English Clays Lovering Pochin & Company.

DR. M. C. FORD, a graduate of Oxford University, who has been Imperial Chemical Industries Research Fellow at the Dyson Perrins Laboratory, Oxford, since last year, has been appointed Lecturer in Organic Chemistry at Aberdeen University. DR. G. L. KINGTON, who has been appointed

Lecturer in Physical Chemistry, is a graduate of Bristol University and has been a Research Fellow in the chemistry department at Aberdeen University since 1951.

MR. WILLIAM A. SHINE and MR. P. WENZALL, Jr., have joined the Development Department of Celanese Corporation of America. The Department was recently established with E. T. POWERS as director to study new technological developments here and abroad and to act as an instrument for longe-range planning. Mr. Shine for the last three years was director of marketing development for Arnold, Hoffman and Company Inc., American affiliate of Imperial Chemical Industries, and before that was with General Aniline and Film Corporation. Mr. Wenzell comes to Celanese from the United States Bureau of Mines, where for the last four years he was engaged in synthetic fuel development work.

Two new directors have been appointed to the board of General Electric Co., Ltd., MR. O. W. HUMPHREYS, B.Sc., F.Inst.P., M.I.E.E., and MR. A. L. G. LINDLEY, M.I.Mech.E.

Mr. O. W. Humphreys is the director of the Research Laboratories of the company at Wembley, Middlesex. He joined the staff of the Laboratories in 1925 and in 1927 was appointed to its leading scientific staff in charge of the heat group. During the war he acted as Assistant Director with general responsibilities for administrative matters.

Mr. Humphreys is also a member of the Council of the Electrical Research Association and a director of E.R.A. Patents Ltd.; vice-president of the Institute of Physics; a member of the National Committee of the International Electrotechnical Commission; chairman of Telecommunications Standards Committee of the British Standards Institution; a member of the General Council of BSI; a member of the Council of The British Welding Research Association; chairman or member of various BSI technical committees; member of the Council of the Institution Electrical Engineers and member of the Utilisation Section Committee of the IEE; member of the Council of the British Non-Ferrous Metals Research Association and a director of Lumifax Ltd.

Mr. A. L. G. Lindley joined Fraser & Chalmers Engineering Works in 1918 as an apprentice and after spending some years as an assistant engineer in the Mining Department was appointed in 1932 Chief Engineer of The British General Electric Co., Ltd., of South Africa. He was later appointed Assistant General Manager and a Director of that Company. Returning to England in 1949, he became General Manager of the Fraser & Chalmers Engineering Works.

Obituary

MR. P. A. W. CAME, chairman of Joseph Crosfield & Sons, Limited, and William Gossage & Sons Limited, and a director of Industrial Soaps Limited, whose death we recorded on 4 July (p. 38) was a native of Bristol and started work with the old established company of Bristol soap manufacturers, Christr. Thomas & Bros. Limited.

After service in the 1914-18 war he was appointed works manager of a London soap factory, which he left to take up the appointment of works director of Edward Cook & Company Limited, of Bow, London. In 1938 he went to Warrington as works manager of Joseph Crosfield & Sons Limited. Soon after the outbreak of the war in September, 1939, he was released by the company to superintend the building and to bring into production a new ordnance factory in Leicestershire, which was planned for carrying out explosives filling for the Ministry of Supply.

On the completion of this work, he became deputy director of the Ministry of Supply in London, which position he held until 1944, when he was released by the Ministry to become technical director of Joseph Crosfield & Sons Limited. He was elected chairman on 1 April, 1946. In addition to the chairmanship of Crosfield's and Gossage's, Mr. Came was chairman of the Oil Hardeners' Committee; a member of the General Council and chairman of Group E of the Association of British Chemical Manufacturers; a member of the Joint Industrial Council of the Soap, Candle and Edible Fat Trades Employers' Federation; and a member of the North Western Regional Board for Industry from May 1946 to May 1947.

Publications & Announcements

THE June issue of the 'Alloy Metals Review,' published by High Speed Steel Alloys Ltd., of Widnes, consists of a paper by J. E. Russell on the manufacture of high-duty forged pressure vessels. This paper describes in some detail the construction of a vessel in 3 per cent Cr-Mo steel, and of a special vessel for very high pressure, such as might be required for a chemical process. Mechanical, metallurgical and pressure tests are also described.

* * *

THE main contribution to the latest issue of the *Sulzer Technical Review* is a detailed account of a Sulzer radiation boiler and its erection in the new steam power station of CIBA Limited, Basle. The boiler itself, which raises from 176,000 to 220,000 lb. of steam per hour at a design pressure of 710 lb. per sq. in. and a temperature of 840°F., was ordered by CIBA Limited for the extension of their power plant. The article also describes the various auxiliaries, control equipment and supervision instruments, which were all supplied by Sulzer Brothers as general contractors. A second article reports on experience acquired in the use of heavy fuel oils in diesel engines and cites a few typical examples of Sulzer diesel installations operated on heavy oils. Detailed information is furnished on the service results obtained. Short notes touch on a wide variety of subjects including a modern sewage treatment plant in Switzerland.

* * *

AMONG particularly interesting equipment described in No. 10 of 'Towers Laboratory News,' published by J. W. Towers & Company, Ltd., Victoria House, Widnes, is the Towers Simmerswitch Unit. This gives almost continuously variable current control from zero to maximum by switching the current on and off at predetermined intervals, and provides good equilibrium temperature regulation. The unit is fitted with BS 5 amp. 3-pin plug and socket, and can be inserted between the electric supply and the apparatus to be controlled without any further wiring. Prominence is also given in this issue to the new laboratory circulating vacuum evaporator. This was described and illustrated in THE CHEMICAL AGE on 27 June (p. 987).

A NEW catalogue of isotopes, both radioactive and stable, produced by Oak Ridge National Laboratory, Oak Ridge, Tennessee, is now available. It replaces a previous edition published by the Atomic Energy Commission in March, 1951. More than 100 radioactive and 175 stable isotopes are listed in the new catalogue, together with prices and descriptive material. The catalogue at $1 per copy, or information about radioisotopes, may be obtained by writing to Carbide and Carbon Chemicals Company, Oak Ridge National Laboratory, Radioisotope Sales Department, Post Office Box P, Oak Ridge, Tenn.

* * *

A CHANGE in its method of quoting prices is made by Evans Medical Supplies, Ltd., of Speke, Liverpool, in the July edition of its List 'A.' This is the first issue to quote solids by metric weight and liquids by metric volume for the home trade. All items sold by weight are indicated by a symbol, and all those not so marked are sold by volume. The standard winchester will contain two litres. The next smaller standard pack is 500 millilitres for which the name 'Demil' (Demi-litre) has been coined. Prices for drugs, fine chemicals and pharmaceutical preparations are now quoted per container. Conversion tables of Metric and Imperial equivalents are given at the beginning of the volume. While it is appreciated that the adoption of the new system may involve some inconvenience at first, it is felt that the change will be amply justified by the overall increase in efficiency and economy in clerical labour.

* * *

'LAUNDRIES and Laundry Requisites,' published by the Anglo-Scottish Press Ltd., is well known for its comprehensive listing of launderers, dyers and cleaners, of all their requirements, and of those who supply them. The publishers believe that they have succeeded in making this Coronation Year issue, the 12th edition, the most complete and accurate yet published. As before, it is virtually a three-in-one directory, containing a buyer's guide for launderers, dyers and cleaners, a directory of laundries, and a directory of dyers and cleaners. The directory costs 7s. 6d.

WITH the ever increasing numbers of scientific papers published, the need for annual, even quarterly, reviews becomes steadily greater, and the 'Reports on the Progress of Applied Chemistry,' from the Society of Chemical Industry, is perhaps one of the most important publications of the year; Volume XXXVII for 1952 has just appeared. The form and contents of these volumes are too well known to require description, but three new sections deserve mention. In 'General Microbiological Processes,' L. A. Allen describes some of the recent advances in knowledge likely to be of use to the microbiologists engaged in what is now a rapidly expanding branch of chemical industry; Dr. P. T. Gilbert and H. S. Campbell of the British Non-Ferrous Metals Research Association review about 200 papers on 'Corrosion of Metals;' and G. H. Whiting of the London Brick Co. considers 'Road and Building Materials.' Nearly all the regular sections are included, the book is as well produced as ever, and altogether it is an essential for every chemist.

* * *

A NEW time recorder—a specially built all-metal machine which is claimed to speed up the clocking-on process, thus reducing the likelihood of employees forming queues—is now being produced by Blick Time Recorders Limited, 96-100 Aldersgate Street, London, E.C.1. Known as the Blick Autoclip, it is a fully automatic time recorder operated by one hand—that which inserts the card. Among other advantages the new machine is fitted with two-colour mechanism, by means of which all 'lates' and 'overtimes' are automatically stamped in red, thus saving much time in the wages office.

* * *

MADE from vinyl chloride-acetate and polyvinyl chloride resins, Vybak rigid sheets are produced by Bakelite Ltd., 12-18 Grosvenor Gardens, London, S.W.1, in a range of thicknesses and in a variety of colours and surface finishes. They are fully described in a booklet recently published by the company. It is claimed that the ease of forming these thermoplastic materials further multiplies the variety of finished products that can be made from the sheets, while their properties, particularly their ability to maintain shape and dimensions despite humidity changes, enable them to perform the jobs assigned most efficiently. They are odourless, tasteless and non-toxic.

RESEARCH at the Tin Research Institute, Fraser Road, Perivale, Greenford, Middlesex, suggests that it may soon be practicable to substitute copper lead bearings by using a new alloy of aluminium with 30 per cent of tin. Advantages claimed for the new alloy are that it can be used in contact with mild steel shafts that have not been specially hardened, it has excellent anti-friction properties, it is relatively cheap and it can be bonded to steel strip or to duralumin backings. Further information regarding this development is given in No. 28 of *Tin and its Uses*, published by the Tin Research Institute.

* * *

IT is not surprising that the rapid expansion of polyester plastics, the new techniques, and the many novel applications evolved, have attracted not only considerable attention, but also many inquiries from potential users. Scott Bader & Co., Ltd., the manufacturers of 'Marco' and 'Crystic' resins, have now produced an extremely useful little handbook intended to be of practical value to the fabricator. This contains many helpful hints and formulations, which have not been published elsewhere, on many different applications of the resins, together with a guide to suppliers of accessory materials. Supplementary technical data to the 'Polyester Handbook' will be issued periodically.

* * *

THE extent to which the Government now concerns itself with industrial affairs and its known preference for dealing with representative organisations rather than individual firms renders particularly important one of the objects of the British Chemical Plant Manufacturers' Association—that of placing before the Government, the chemical and allied industries and others the views of members on matters affecting the chemical plant industry. This point is emphasised in a booklet just published by the Association with the principal purpose of making more widely known its services to members. The scope of these may be judged by the headings under which they are detailed—advertising, building licences, chemical plant inquiries, export promotion, import licensing, information, iron and steel rationing, standardisation and travel. Copies of the booklet—which should be of much interest to firms contemplating membership of the Association—are obtainable free on application to the Secretary at 14 Suffolk Street, S.W.1.

Commercial Intelligence

New Registrations

Ancon Metals & Chemicals Ltd.

Private company. (521,554.) Capital £50,000. Machinery and metal merchants and brokers; importers, exporters and dealers in pharmaceutical, medicinal and chemical, industrial and other preparations. Directors: P. Ansiau, S. W. K. Benjamin, Brig. A. E. Hodgkin. Solicitors: Herbert Oppenheimer & Co., 20 Copthall Avenue, E.C.2.

Oxy-Catalyst Co. Ltd.

Private company. (521,537.) Capital £100. Manufacturers and producers of apparatus, equipment, appliances and accessories for industrial, domestic and other purposes, including apparatus for the extraction of combustible elements from waste gases and vapours, etc. Subscribers: G. G. Williams, D. Wisdom. First directors are not named. Solicitors: Slaughter & May, 18 Austin Friars, E.C.2.

Laboratories for Applied Chemistry Ltd.

Private company. (521,437.) Capital £100. Manufacturers of and dealers in chemicals, drugs, medicines, plasters, disinfectants, fertilisers, etc. Directors: J. Rabinovitch, Havva Rabinovitch. Reg. office: Furnival House, 14-18 High Holborn, W.C.1.

Changes of Name

The following changes of name have been announced: A. Boake, Roberts & Co., Ltd., to A. Boake, Roberts & Company (Holding), Ltd., on 28 May, 1953. Johnsons of Hendon, Ltd., to Johnsons of Hendon (Holdings), Ltd., on 29 May, 1953.

Company News

Pinchin Johnson & Associates

The directors of Pinchin Johnson and Associates recommend a final dividend of 12½ per cent, making a total of 20 per cent for the year, compared with 25 per cent for each of the four previous years. After allowing for tax and depreciation, etc., the net profit was £538,241, compared with £697,194 for the previous year.

Griffiths Hughes Proprietaries Ltd.

An increase of £117,929 in group profits for the year ended 31 March last has been announced by the directors of Griffiths Hughes Proprietaries Limited. An ordinary dividend of 7½ per cent is recommended.

British Tin Investment Corporation

In respect of the year ending 31 December next, the British Tin Investment Corporation has declared an interim dividend of 7½ per cent, compared with 5½ per cent last year.

Market Reports

LONDON.—There has been no decided trend in the markets during the past week and the movement in the bulk of the routine soda and potash chemicals has been fairly good, with prices displaying a firm undertone.

Contract delivery specifications from the textile industry continue to cover good quantities. Export trade has been fairly well maintained in the face of keen competition.

Very little change can be expected at this time of the year in the position of the coal tar products and productions of most items is adequate to meet all home demands.

MANCHESTER.—In spite of the industrial holidays, which continue to affect operations at consuming works in Lancashire and the West Riding of Yorkshire, fair activity has been reported on the Manchester chemical market during the past week. Delivery specifications for a wide range of products are circulating from the cotton and other textile industries and other users are taking a fair aggregate quantity. New business, however, seems largely to be confined to prompt or near delivery positions. In the fertiliser trade, the early delivery rebates in several sections have so far attracted only moderate buying interest.

GLASGOW.—Probably the much increased demand for a wide range of chemicals for spot and prompt delivery is due to an extent to stock piling in view of the coming holiday break. Whatever the reason, it has been a very busy week all round with the export market also brightening up.

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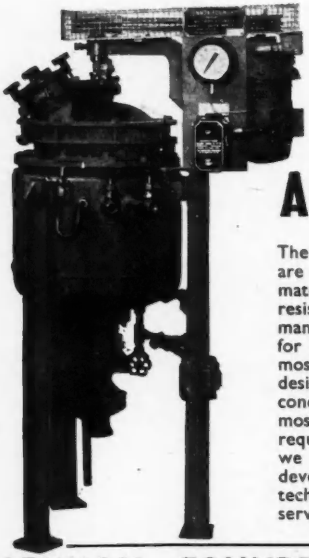

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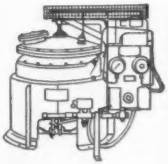

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The Lennox Foundry Company are specialists in the supply of materials of construction for resisting corrosion and in the manufacture of process plant for specialised applications. In most cases we can supply plant designed for particular working conditions, constructed of the most suitable materials for these requirements, and, if necessary, we can build pilot plant for developing new processes. Our technical staff are always at your service to give advice.

IN TANTIRON AND HOMOGENEOUSLY LEAD LINED STEEL

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CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive, or a woman aged* 18-59 *inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order,* 1952.

CABOT CARBON LIMITED at **STANLOW**, near **CHESTER**, requires an **ASSISTANT TECHNICAL MANAGER** as a result of their expansion programme.

Duties would involve the supervision of an analytical and rubber laboratory after a period of training, conceivably with some technical service and research direction as well. The training would include a period in the United States at the Cabot plants and laboratories. The position has excellent opportunities for development and promotion of the right applicant.

Educational qualifications are an Honours B.Sc. Degree in Chemistry, Physics, Chemical Engineering or an A.R.I.C. Some industrial experience is essential, preferably in Rubber Technology or in raw materials supply to the rubber industry. The position is a challenging one, requiring high energy, mental alertness, and the ability to co-operate with people at all levels. Emotional maturity and growth potential are necessary, and the applicant should be in the 24 to 32 years' age group.

Applications will be treated in confidence and should give age, marital status, details of educational and industrial qualifications and salary required, and addressed to:

THE TECHNICAL MANAGER,
CABOT CARBON, LTD.,
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CHEMIST/ANALYST, with knowledge of modern methods of Inorganic and Organic Analysis, required by N.W. London Fine Chemical Manufacturers. Permanent pensionable position for right applicant, who should hold degree or equivalent. Particulars age, education, experience and salary, to **BOX No. C.A. 3237, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

EMULSION CHEMIST REQUIRED by London Plastics Company. Excellent opportunity for highly qualified and experienced man. Write full details to **BOX No. C.A. 3236, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

FOR SALE

CHARCOAL, ANIMAL AND VEGETABLE horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—**THOS. HILL-JONES, LTD., "INVICTA" MILLS, BOW COMMON LANE, LONDON, E. TELEGRAMS: "HILL-JONES, BOCHURCH LONDON." TELEPHONE 3285 EAST.**

TO BE SOLD, quantities of **GLYCERINE,** Fatty Acid, and other Chemicals. Ring **WESTERN 6489.**

FOR SALE

600

PROCESS PLANT

TWO 72 in. **HYDRO EXTRACTORS** by Thomas Broadbent. 72 in. galvanised basket, 20 in. deep, ½ in. perfs. Motorised 400/3/50.

7 **FILTER PRESSES,** plate and frame type, each with 51 frames forming cakes 29 in. sq. by 2 in. Individual plate discharge. Plates have ribbed surface.

ROTARY VACUUM FILTER by Davey Paxman. Drum 33 in. by 36 in. dia., with stepped perfs. F. and l. pulley drive through spur and worm gear.

Unused Johnson Wooden Plate and Frame **FILTER PRESS CARCASE,** with hydraulic closing gear. Frame size 61 in. by 49 in. Cake size 48 in. by 38 in. by 2⅜ in. thick. Suitable for 27 chambers with cap. 80 sq. ft. With rubber lined filtrate trough.

2 Recessed Plate type **FILTER PRESSES** by Manlove Alliott, with 54 plates 36 in. sq. by 1 in. thick. Hand op. closing gear.

LABELLING M/C by Rawsons, for pint or 16 oz. size flat or square. Cap. 24-30 per min. Numbering device. Motorised 400/3/50. Unit mounted on rubber tyred wheels.

Carton filling, packing, wrapping and labelling machine by **SOCIETE INDUSTRIELLE SUISSE,** adjustable for cartons from 73 mm. sq. by 38 mm. to 65.6 mm. sq. by 38 mm. Motorised 400/3/50. Complete with label attachments and heat sealing device. Conveyor feed approx. 55 per min.

De-airing type **PUG MILL** by Bonnot. Primary chamber 4 in. diam. secondary worm extruder 3 in. diam.—3 in. discharge with 7½ in. by 9 in. opening. Of Aluminium constr., with S. Steel shaft and worms. Motorised 220/440/3/50.

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LIVERPOOL, 13.

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STAINLESS STEEL PLATE, 4 ft. by 3 ft. by ¼ in. thick.
PASCALL PIN DISC GRINDING MILL.
Unused **RUBBER CONVEYOR BELT,** 16 in. wide by 100 ft.
BOX No. C.A. 3233, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.

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BOILING PAN, C.I., jacketed, 150 galls.
BOILING PAN, 30 galls., copper with C.I. jacket, arranged for hand tilting.
Three Welded Horizontal Cylindrical, 500 gall. **STORAGE TANKS,** double compartment.
FILTER PRESS, flush plate and distance frame type, by "Johnson," cake size 29 in. square by 1 in. thick; 40 plates and 41 frames.
FILTER PRESS, recessed plate type by "Johnson," cake thickness 1 in.; 24 plates, each 24 in. square.
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Cannon Steam jacketed enamel lined **PANS,** 10 and 25 galls.; also 30 gall. **FURNACE PANS.** All new and unused.
Doulton 25 gall. **COPPERS** with lids. New and unused.
Several new and unused double trough type steam jacketed **MIXERS,** Fitted twin contra-rotating Z blades. Arranged for hand tilting and suitable wet or dry mixing. Capacity 25 galls.

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10 in. **BORE**—12 in. **BORE**

Lengths 5 ft. to 12 ft.

1,500 lengths in all.

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3—Baker Perkins and Werner Jacketed **MIXERS,** screw tipping pattern, friction pulley drive, single geared, with double-fin type agitators.

4—Gardner **RAPID SIFTER MIXERS** and **MIXERS** only, various sizes, one with brass fitted interior and glass-lined end plates.

27—Various **POWDER DRESSING** or **SIFTING MACHINES,** totally enclosed, with barrels from 80 in., long by 22 in. diam. to 120 in. long by 30 in. diam., belt driven with collecting worm in hopper bottoms.

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4—Johnson **FILTER PRESSES,** 24 in. square, side feed and enclosed delivery, fitted 29 plates and 30 frames.

1—Johnson **FILTER PRESS,** 36 in. square, plate and frame type, double inlet and enclosed delivery ports.

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Steam-heated **FILTER PRESS,** Premier type, 32 in. square, with 30 recessed plates

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100g., 150g. and 200g. New **JACKETED PANS,** all welded, on three legs.

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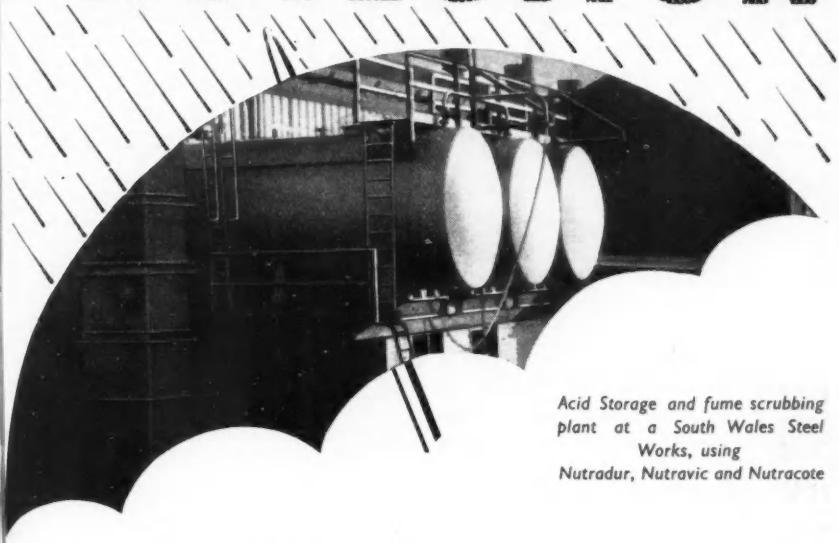

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